NASA SP-7011 (47)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during January 1968.

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. FEBRUARY 1968

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Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics (AIAA), and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

a. NASA entries identified by their *STAR* accession numbers (N68-10000 series),
b. AIAA entries identified by their *IAA* accession numbers (A68-10000 series); and
c. LC entries identified by a number in the A68-80000 series.

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(continued)

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For further details please consult the *Introductions* to *STAR* and *IAA*, respectively.

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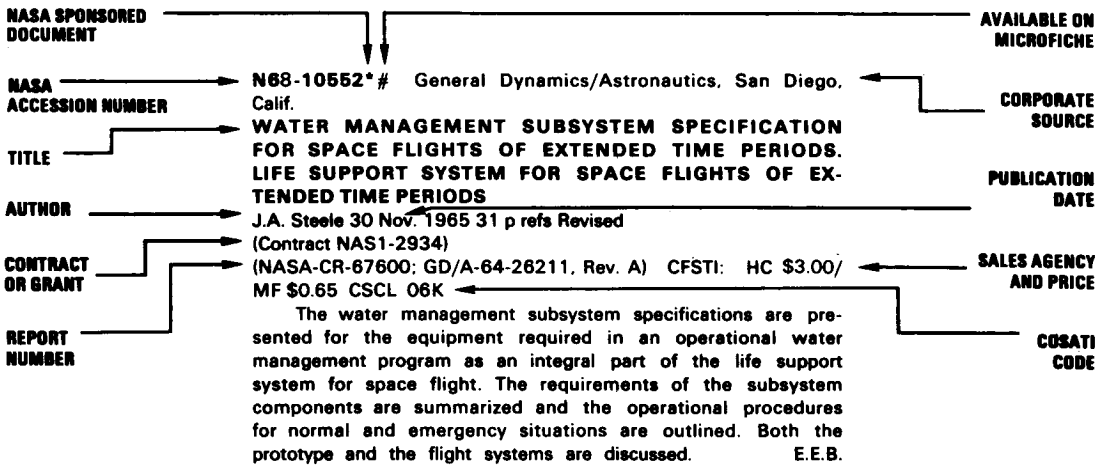

AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography FEBRUARY 1968

STAR ENTRIES

N68-10006# Army Behavioral Science Research Lab., Washington, D. C. Support Systems Research Div.

RAPID SCREENING OF TACTICAL IMAGERY AS A FUNCTION OF DISPLAY TIME

James A. Thomas and Robert Sadacca Jun. 1967 30 p
(BESRL-TRN-189; AD-657584)

An experimental study was made to assess the effectiveness of two techniques for rapid screening to select imagery frames of high military potential and to determine the effects of variations in display time on screening performance. Two samples of image interpreters, each consisting of three matched groups, screened three sets of imagery at three different display time intervals (5, 15, and 25 seconds per frame for Sample 1; 10, 20, and 30 seconds per frame for Sample 2). Each interpreter was instructed to perform two screening functions while scanning each print--(1) annotate on the frame all areas of military activity he detected; and (2) assign to each print a priority rating of High, Medium, or Low to indicate estimated intelligence value of the frame. Interpreter performance under the two methods was compared in terms of accuracy and validity of the annotations and priority ratings across the six screening time intervals. Results of the study definitely favored the priority ratings technique over annotation screening. The ratings, of high accuracy even with short viewing time, improved significantly both in accuracy and in validity with longer display time. Generally, performance was better on the measures which were less complex and showed fewer target areas. Validity of the number of annotations on a frame, generally low, did not vary significantly with display time. More incorrect as well as correct annotations were made, a finding similar to previous BESRL findings for unspeeded interpretation performance. Author (TAB)

N68-10033*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MICROBIAL DECONTAMINATION AND SAMPLING PROGRAM FOR ANCHORED INTERPLANETARY MONITORING PLATFORM (AIMP-E) SPACECRAFT

F. N. Le Doux Jul. 1967 34 p Presented at the Joint Symp. of the AEC and NASA, Albuquerque, N. Mex., 12–14 Sep. 1967
(NASA-TM-X-63000; X-723-67-375) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Decontamination was effected with chemical solutions of isopropyl alcohol and acetone. One method of recovering viable microorganisms employed control strips with detachable coupons for monitoring the electronic circuit modules and another method employed sterile swabs and templates to monitor other surface areas. Coupons and/or swabs were immersed in a 1% peptone wash solution and sonicated at 25 kc/sec for 12 minutes. Aliquots of the sonicated solution were plated out on agar, incubated and colony counts made. Records were made of the numbers of aerobic and anaerobic spore and vegetative organisms remaining on a surface after the decontamination process. All assembly and test operations were conducted in controlled and/or clean-room facilities. As a result of the evaluation of records, the AIMP-E spacecraft contained an internal burden of 2.19×10^5 organisms and a surface burden of 4.42×10^4. The surface spore loading was estimated at 7.4×10^3 organisms. This spore population on the surface will be reduced to less than 1.89×10^{-9} due to the spacecraft's orbital life expectancy of 3 years and 1440 cycles of temperature change in an ultra high vacuum. Author

N68-10056*# Farnham (Frank C.) Co., Philadelphia, Pa.

VISCOSITY CHANGES IN THE CYTOPLASMA DURING THE FIRST DEVELOPMENTAL STAGES IN THE FROG EGG [VISKOSITATSVERANDERUNGEN DES ZELLPLASMAS WAHREND DER ERSTEN ENTWICKLUNGSSTUFEN DES FROSCHEIES]

Gustaf Oedquist Washington NASA Oct. 1967 15 p refs Transl. into ENGLISH from Ark. für Entwicklungsmech. der Organ., Wilhelm Roux' (Berlin), v. 51, 1922 p 610–624
(Contract NASw-1497)
(NASA-TT-F-11272) CFSTI: $3.00 CSCL 06C

The author studied changes in the viscosity of *Rana fusca* eggs (unfertilized eggs kept in fresh water, unfertilized eggs left in the dissected oviduct, and unfertilized eggs kept in Göthlin's solution for various lengths of time; and in fertilized eggs at various times following insemination). Viscosity was determined by the degree to which 3 min of centrifugation (radius, 14 cm; rate, 2500 rpm) separated pigment and yolk particles from clear cytoplasm in a given specimen. It was found that there is a great difference in viscosity between unfertilized eggs kept in fresh water and fertilized eggs 2 hrs, 3 hrs, and 3 hrs 30 min after insemination. The viscosity decrease in unfertilized eggs kept in fresh water is attributed to incipient cytolysis due to water absorption. The viscosity of the fertilized eggs drops sharply just before each cleavage and increases again afterwards, to remain high until the next cleavage is ready to occur. These periodic fluctuations in viscosity, related to the rhythm of cell division, coincide with periods of maximum and minimum susceptibility to damage by KCN, hypoxia, hypothermia, and hyperthermia. Author

N68-10122*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

APPLICATION OF CELL CULTURE AS A PRIMARY TOXICITY SCREEN OF POSSIBLE SPACECRAFT CONTAMINANTS

Richard B. Hays Washington NASA Nov. 1967 13 p refs
(NASA-TN-D-4251) CFSTI: HC $3.00/MF $0.65 CSCL 06T

Cell culture has been investigated with regard to its applicability as a primary toxicity screen. Forty-nine compounds have been screened by this method. These compounds are all contaminants which may occur in manned spacecraft. The data presented indicate that cell culture can be a useful tool for selecting, from a long list, those compounds most likely to be toxic to a living system. The compounds tested might be ranked, in terms of decreasing toxicity to cells in culture, as follows: unsaturated aldehydes, amines, aldehydes, acids, ketones, and alcohols. Author

N68-10135* Scientific Translation Service, La Canada, Calif.
THE SIGNIFICANCE OF INTESTINAL BACTERIA FOR NUTRITION, II [DIE BEDEUTUNG DER DARMBAKTERIEN FUER DIE ERNAEHRUNG, II]
Max Schottelius Washington NASA Nov. 1967 14 p Transl. into ENGLISH from Arch. Hygiene Bakteriologie (Munich), v. 42, 1902 p 48–70
(Contract NASw-1496)
(NASA-TT-F-11362) CFSTI: HC $3.00/MF $0.65 CSCL 06C

Based on experimental work with sterile chickens the author establishes the fact that the activity of intestinal bacteria is indispensable for the life of plants and for the nutrition of vegetables and man. Author

N68-10149# Army Medical Research Lab., Fort Knox, Ky.
SOME OBSERVATIONS AND MEASUREMENTS OF THE PULFRICH PHENOMENON Interim Report
George S. Harker and Orvil L. O'Neal, Jr. 9 May 1967 11 p refs
(AMRL-728; AD-652705) CFSTI: HC $3.00/MF $0.65

The Pulfrich pendulum was evaluated as a potential screening device for the detection of anomalies of binocular vision. For this purpose, a booth was set up at the Kentucky State Fair (1964) and the general public invited to observe the pendulum and record their responses with the equipment provided. The obtained results indicate that a clear dichotomy can be achieved between those who have binocular vision and those who do not. However, gradiations of binocular vision from poor to good cannot be achieved with the pendulum as presently understood. Contrary to explanatory theory the characteristic seen shape of the seen pendulum path was asymmetrical following the rule that the path was displaced away from the observer on the side of the filtered eye. Author (TAB)

N68-10179* Duke Univ., Durham, N. C. Dept. of Physiology and Pharmacology.
ACTION POTENTIALS WITHOUT CONTRACTION IN FROG SKELETAL MUSCLE
Robert S. Eisenberg and Peter W. Gage [1967] 10 p refs
(Grant NGR-34-001-005)
(NASA-CR-90047) CSCL 06C

In muscle fibers which have been exposed to a 400 mM glycerol-Ringer solution for 1 hour and then returned to Ringer solution, propagated action potentials with no after-depolarization can be observed. These action potentials cause no contraction. The uncoupling of excitation and contraction is attributed to the absence of transverse tubules after this treatment. The results indicate that action potentials gain access to the contraction-activating mechanism by way of the transverse tubular system. Author

N68-10181*# National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Tex.
A REVIEW OF MEDICAL RESULTS OF GEMINI 7 AND RELATED FLIGHTS
Aug. 1966 298 p refs Review held at NASA. John F. Kennedy Space Center, 23 Aug. 1966
(NASA-TM-X-60589) CFSTI: HC $3.00/MF $0.65 CSCL 06S

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N68-10182*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
CARDIOVASCULAR CONDITIONING
Lawrence F. Dietlein and William V. Judy *In its* A Rev. of Med. Results of Gemini 7 and Related Flights Aug. 1966 p 1–35 refs (See N68-10181 01-04)

The equipment used in the experiment consisted of a pneumatic timing or cycling system which alternately inflated and deflated the leg cuffs attached to the Gemini astronauts' thighs. The experiment was conducted to determine the efficacy of such a technique in protecting against cardiovascular deconditioning. Preflight and postflight tilt-table tests were given to the crews, and summary data on the heart rate changes and blood pressures are tabulated. The results observed in the Gemini V and VII pilots are assessed and compared. Based on preflight and postflight data, it was concluded that the pulsatile cuffs were not effective in lessening postflight orthostatic intolerance. This conclusion was reached due to the higher heart rates observed during subsequent tilts, as compared with the control subject. However, the pulsatile cuffs appeared to be effective in lessening the degree of postflight pooling of blood in the lower extremities as judged by the strain gauge technique. M.G.J.

N68-10183*# National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Tex.
INFLIGHT EXERCISE—WORK TOLERANCE
Lawrence F. Dietlein and Rita M. Rapp *In its* A Rev. of Med Results of Gemini and Related Flights Aug. 1966 p 36–47 refs (See N68-10181 01-04)

Utilizing mild exercise as a provocative stimulus, no significant decrement in the physical condition of either of the Gemini VII

crewmembers was apparent. The rate of return of the pulse rate to preexercise levels, following inflight exercise periods, was essentially the same as that observed during preflight baseline studies. The objective was the day-to-day evaluation of the general physical condition of the flight crew with increasing time under space flight conditions. The basis of this evaluation was the response of the cardiovascular system (pulse rate) to a calibrated workload. Author

N68-10184*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
INFLIGHT PHONOCARDIOGRAM
C. Vallbona (Baylor Univ., Houston, Tex.) and Lawrence F. Dietlein *In its* A Rev. of Med. Results of Gemini and Related Flights Aug. 1966 p 48–67 refs (See N68-10181 01-04)

Simultaneous electrocardiographic and phonocardiographic records were obtained on both crew members during the flight of Gemini IV and Gemini V, and on the pilot of Gemini VII. Analysis of the data recorded during flight revealed: (1) wide fluctuations of the duration of the cardiac cycle within physiological limits throughout the mission; (2) fluctuations in the duration of the electromechanical systole that correlated with the changes in heart rate; (3) stable values for the electromechanical delay; (4) higher values for duration of systole and electromechanical delay in the command pilot of Gemini V suggesting cholinergic influences; and (5) evidence of adrenergic response at lift-off, at reentry, and for the few hours preceding reentry. This adrenergic response was observed in all astronauts participating in this experiment. Author

N68-10185*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
BIOCHEMICAL ANALYSIS OF BODY FLUIDS IN MANNED SPACEFLIGHT
Harry S. Lipscomb (Baylor Univ., Houston, Tex.), Elliot Harris, and Lawrence F. Dietlein *In its* A Rev. of Med. Results of Gemini and Related Flights Aug. 1966 p 68–81 (See N68-10181 01-04)

Biological fluids were analyzed to determine the metabolic cost of manned spaceflight, and the results were assessed to obtain an indication of the physiological status of the astronaut. The measurements consist of (1) preflight collection of urine samples and whole blood from each crewman to establish baseline values; (2) a determination of their physiological status by analyzing urine samples collected inflight; and (3) the use of urine and blood samples collected immediately postflight, and at 24 and 48 hours postflight, to establish the rate of return to baseline preflight values. The biochemical determinations consist essentially of fluid and electrolyte balance and hormonal studies, and correlation of the two. The inflight findings show significant decreases in fluid intake and urinary output; marked decreases in urinary excretion of sodium, chloride, and potassium; and a trend toward elevation of aldosterone. Upon reentry, considerable increases were noted in catecholamine excretion and 17-hydroxycorticosteroids. M.G.J.

N68-10186*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
REVIEW OF MEDICAL FINDINGS OF GEMINI VII AND RELATED MISSIONS—BONE DEMINERALIZATION
Pauline Beery Mack (Tex. Womans Univ.), Paul A. La Chance, George P. Vose (Pa. State Univ.), and Fred B. Vogt (Tex. Univ.) *In its* A Rev. of Med. Results of Gemini and Related Flights Aug. 1966 p 82–126 refs (See N68-10181 01-04)

Bone demineralization experiments were conducted on the primary and backup crews of the 14-day Gemini VII mission to determine the effect upon the human skeletal system of prolonged weightlessness and immobilization. Radiographic bone densitometry techniques were used, and radiographs were made preflight and postflight of the left foot in lateral projection and of the left hand in posterior–anterior projection. Sections of the bones of the foot and hand were evaluated for changes in skeletal mineralization. Comparisons were drawn with the results of ground-based bed rest studies in which calcium provision in the diet was varied. Also considered were the effects on the crews of the Gemini IV and V flights. The results show: (1) The food intake level is a major parameter in accounting for the differences in levels of mineral loss by the astronauts. (2) The isotonic and isometric exercises engaged in by the Gemini VII crew was partly responsible for the comparatively low losses in foot bone mass. (3) Skeletal losses were replaced shortly after termination of the flight. M.G.J.

N68-10187*# National Institutes of Health, Bethesda, Md.
CALCIUM AND NITROGEN BALANCE
G. Donald Whedon, Leo Lutwak (Cornell Univ., Ithaca, N. Y.), and William Neuman (Rochester Univ.) *In* NASA. Manned Spacecraft Center A Rev. of Med. Results of Gemini 7 and Related Flights Aug. 1966 p 127–165 (See N68-10181 01-04)

The effects of several variables on certain parameters related to overall body economy were measured to assess the results of space flight stress on the performance of the crew and back-up crew of the Gemini VII. Measurements were made of the calcium in the urine, feces, diet, and sweat, as well as magnesium, sodium, potassium, phosphate, sulfate, chloride, and nitrogen, during the preflight control, inflight, and postflight phases. The data show: (1) Sweat losses were insignificant throughout, comprising less than one milliequivalent of calcium at any phase of the study. (2) Urinary losses of calcium increased inflight, and increased by a greater amount during the second week of flight. The intake was less inflight by about 300 milligrams, and the net result was slightly negative calcium balance. (3) Significant differences in magnesium, nitrogen, sodium, and potassium balance changes were attributed to dietary intake variability. M.G.J

N68-10188*# Baylor Univ., Houston, Tex.
INFLIGHT SLEEP ANALYSIS
Peter Kellaway and Robert L. Maulsby *In* NASA. Manned Spacecraft Center A Rev. of Med. Results of Gemini 7 and Related Flights Aug. 1966 p 166–189 refs (See N68-10181 01-04)

The electroencephalogram of Command Pilot Frank Borman was recorded continuously during the first two days of the Gemini VII flight. This attempt to record EEG was designed to study sleep cycles during flight and to assess the effect of weightlessness upon the electrical activity of the brain. The technique used and the preliminary results of visual interpretation of the record are discussed. The two sleep periods which occurred were evaluated visually for depth of sleep versus time on a minute-to-minute basis. The first sleep period was found to be inadequate in terms of depth and length, but the second sleep period was normal. The tracing during the alert state, including ascent and orbital flight, showed no pathological changes and no definite alterations which could be attributed to weightlessness. It is concluded that these preliminary results confirm the view that orbital flight has no apparent deleterious effect on cerebral function. Author

N68-10189*# Naval School of Aviation Medicine, Pensacola, Fla.
HUMAN OTOLITH FUNCTION: MEASUREMENTS IN GEMINI FLIGHTS V AND VII
Ashton Graybiel and Earl F. Miller, II *In* NASA. Manned Spacecraft Center A Rev. of Med. Results of Gemini 7 and Related Flights Aug. 1966 p 190–249 refs (See N68-10181 01-04)

The Gemini V and VII astronauts were involved in two experimental probes related to the human otolith function. One was concerned with the influence of nonvisual cues on spatial localization. The astronauts' task was to set a dim line of light in

an otherwise dark field to an external horizontal reference; the earth's horizontal was used pre- and postflight and an element in the spacecraft, horizontal with respect to the astronaut, was used inflight. The outstanding finding was the small intratest variance in the settings made inflight and relatively small bias in three of the four astronauts. The other experiment consisted in the pre- and postflight measurement of ocular counterrolling which depended mainly on a reflex response having its genesis in the otolith apparatus. No significant differences in response were demonstrated. Author

N68-10190*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

SUMMARY AND CONCLUSIONS CONCERNING MEDICAL RESULTS OF THE GEMINI VII MANNED SPACE FLIGHT

Charles A. Berry *In its* A Rev. of Med. Results of Gemini 7 and Related Flights Aug. 1967 p 250–280 (See N68-10181 01-04)

Summary data are presented on the results obtained from pre- and postflight medical studies consisting of physical examination, blood, urine, and X-ray analyses. These are supplemented by inflight observations made by realtime physiological monitoring and adequate reporting of the crews inflight, and from postflight debriefings. The adaptive physiology noted in man's response to the flights and readaptation to a 1-g environment is discussed. Figures are included to depict the heart rate tilt response compared with mission duration; and the Gemini pilots' white blood cell response, blood volume, hemolysis, ergometry, heart rates, and blood pressures. M.G.J.

N68-10191*# National Aeronautics and Space Administration, Washington, D. C.

SUMMARY OF MEDICAL EXPERIMENTS PROGRAM. REVIEW OF FINDINGS THROUGH GEMINI 7

S. P. Vinograd *In* NASA. Manned Spacecraft Center A Rev. of Med. Results of Gemini 7 and Related Flights Aug. 1966 p 281–287 (See N68-10181 01-04)

Discussion centers on the experiments conducted to determine effects, mechanisms, predictive means, and the most effective preventive or corrective measures to protect man's welfare in space flight and on very long duration missions of the future. Negative and positive findings are assessed in relation to studies on cardiovascular reflexes, exercise tolerance, phonoelectrocardiograms, bioassays of body fluids, bone densitometry, mineral balance, electroencephalograms, and human otolith functions. Important contributions in the areas of red cell enzymology, dehydration, and fluid balance are foreseen. M.G.J.

N68-10198# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PHYTOPLANKTON AS AN AGENT OF THE SELF-PURIFICATION OF CONTAMINATED WATERS [FITOPLANKTON KAK AGENT SAMOOCHISHCHENIYA ZAGRYAZNENNYKH VOD]

G. G. Vinberg and T. N. Sivko 18 Aug. 1967 43 p refs Transl. into ENGLISH from Tr. Vsesoyuznogo Gidrobiol. Obshchestva Akad. Nauk SSSR (USSR), v. 3, 1956 p 3–23
(FTD-MT-66-13; AD-659310)

Planktonic algae when grown on a large scale on undiluted city sewage sharply accelerate the process of self-purification; this is expressed in faster initial lowering of the biological oxygen content (BOR), early termination of the anaerobic phase, the appearance of free oxygen, and in the accelerated onset of nitrification. The accumulation of a large quantity of organic substances synthesized by the algae in the composition of the bodies of the living cells is not reflected in the magnitude of the BOR. With the large-scale development of green algae in self-cleaning sewage the death rate of coliform bacterium is sharply increased. The construction of ponds filled with undiluted sewage is the simplest way to use green organisms as agents of self-purification; it draws attention also as an effective method of purification, especially applicable in regions with warm dry climates. Further study of the conditions favorable to the development of photosynthesizing planktonic organisms will allow setting up problems in the large-scale cultivation of algae as one of the methods of utilizing sewage. In particular one should clarify the possibility of using algae grown on sewage to increase the productivity of piscicultural ponds. Author

N68-10200*# Miami Valley Hospital, Dayton, Ohio. Dept. of Research.

THE EFFECT OF REPETITIVE FEEDINGS ON THE ACCEPTABILITY OF SELECTED METABOLIC DIETS

Carol A. Linder and Vickie R. Must Wright-Patterson AFB, Ohio AMRL Jun. 1967 8 p refs Presented at the 45th Ann. Meeting of the Ohio Dietetic Assoc., Dayton, Ohio, 11–13 May 1966
(NASA Order R-85; Contract AF 33(657)-11716)
(NASA-CR-90105; AMRL-TR-66-75; AD-659386) CFSTI: HC $3.00/MF $0.65 CSCL 06P

In three separate metabolic balance studies, the repetitive serving of a liquid, fresh food, and experimental bite-sized, compressed and dehydrated diet was evaluated by means of a graduated hedonic scale for organoleptic acceptability for extended periods of time. A liquid diet, having a low degree of initial acceptability, become monotonous when served for twenty-one days. However, both the one-day cycle menu of fresh foods and the two-day cycle menu of experimental foods remained acceptable over periods of forty-two and thirty days. Respectively, since significant differences among individuals has been demonstrated, and because repetition does not necessarily result in decreased acceptance, more emphasis should be placed on the variation in food preferences on individuals. Perhaps dietitians and homemakers could benefit by using a simple food preference questionnaire, prior to actual menu planning, to ascertain the preferences of the individuals they are responsible for feeding. In relation to the acceptability of individual food items on the fresh diet, it was found that all beverages, peaches, brownies and poundcake, and sliced turkey contributed most to the high acceptability of this diet. Author (TAB)

N68-10227*# Farnham (Frank C.) Co., Philadelphia, Pa.

ELECTRONIC ASPECTS OF THE MECHANISMS OF THE LETHAL AND MUTAGENIC ACTION OF ULTRAVIOLET LIGHT [ELEKTRONNYYE ASPEKTY MEKHANIZMOV LETAL'NOGO I MUTAGENNOGO DEYSTVIYA UF-SVETA]

G. G. Dyadyusha, V. I. Danilov, and O. V. Shramko Washington NASA Nov. 1967 8 p refs Transl. into ENGLISH from Molekul. Biol. (USSR), v. 1, no. 4, 1967 p 539–543
(Contract NASw-1497)
(NASA-TT-F-11339) CFSTI: HC $3.00/MF $0.65 CSCL 06M

The lowest triplet states of pyrimidine bases (PB) and PB derivatives have been studied by the self-consistent-field open-shell and closed-shell methods. Triplet excitation is almost completely localized on the 5–6 bond; this fact favors the reaction of photodimerization. A correlation between the degree of triplet state localization on the 5–6 bond and the ease of photodimerization is demonstrated. Investigation of the ground state of cytosine and cytosine hydrate in neutral and cationic forms shows that the deaminization reaction of cytosine hydrate proceeds through the protonic stage. The relationship between the data obtained and the mutagenic effect of ultraviolet light is discussed. Author

N68-10228# Army Behavioral Science Research Lab., Washington, D. C.

IMPACT OF FEEDBACK ON ACCURACY OF CONFIDENCE LEVELS ASSIGNED BY INTERPRETERS

James A. Thomas and Robert Sadacca Jun. 1967 27 p refs
(BESRL-TRN-187; AD-657583)

The study dealt with the utility of feedback presented under simulated computerized conditions in improving the performance of interpreters in judging the value of their own identifications. Results supported previous findings that interpreters do not as a rule make dependable evaluations of their identifications. Confidence ratings made by interpreters in the high performance subgroup were generally more accurate and complete than those made in the low performance subgroup. Two feedback techniques in which the interpreters were given only data on previous rating performance--their own and their own plus that of other classes--resulted in somewhat more accurate expressions of confidence than did the technique in which interpreters were given their own corrected reports and the imagery they had previously interpreted. Confidence ratings reported by the interpreter group receiving no feedback were the least precise. It was concluded that interpreters confidence ratings can be improved by practice in applying a knowledge-of-results frame of reference. Findings suggest, however, that more than two practice sessions are needed for the interpreter to reach an operationally useful level of accuracy in evaluating the information he provides. Author (TAB)

N68-10232* Duke Univ., Durham, N. C. Dept. of Physiology and Pharmacology.

THE ROLE OF THE ELECTROCHEMICAL GRADIENT IN DETERMINING POTASSIUM FLUXES IN FROG STRIATED MUSCLE

P. Horowicz, P. W. Gage, and R. S. Eisenberg [1965] 22 p refs
(Grant NGR-34-001-005)
(NASA-CR-90061) CSCL 06C

Experiments were conducted to study the unidirectional potassium fluxes for two types of conditions. In one type, the potassium equilibrium was varied by changing $[K^+_o]$ while the internal potential, Y_i, was kept constant. In the other type, the transmembrane potential was varied by changing $[Cl]_o$ while the potassium equilibrium potential was kept constant. These methods are based on the observation that, under appropriate conditions, the transmembrane potential can be made to depend mainly on chloride ion concentration while being relatively insensitive to changes in external potassium ion concentration. The experimental observations described were performed on small bundles of muscle fibers isolated from the semitendinous muscles of *Rana pipiens*. Measurements were made of the internal potential, $^{42}K^+$ influx, and $^{42}K^+$ efflux on preparations initially equilibrated in a Ringer's fluid to which KCl was added so that the final external $[K^+]$ and $[Cl^-]$ were 100 and 217 mmole/liter, respectively. R.N.A.

N68-10250*# American Inst. of Biological Sciences, Washington, D. C. Bioinstrumentation Advisory Council.

SOME NOTES ON THE PROBLEM OF UNCERTAINTY IN BIOLOGICAL MEASUREMENTS

Harold J. Morowitz (Yale Univ.) 1 Mar. 1966 9 p
Contracts NASr-132; Nonr-4526(04))
(NASA-CR-90063; BIAC-M6) CFSTI: HC $3.00/MF $0.65 CSCL 06B

A synthesis of two previously published articles on the problems of measurement and instrumentation in biology is presented. Among the problems discussed are the large number of independent variables, uncertainty on the micro and macro levels, the possibility that the measurement process may act as a stimulus causing changes in the object, and instrument design. Approaches to the problems are outlined, and the uncertainty aspect is emphasized. N.E.N.

N68-10272# N. Y. Air Development Center, Griffiss AFB, N. Y. Display Techniques Branch.

DICHROIC FILTER SPECIFICATION FOR COLOR ADDITIVE DISPLAYS. II: FURTHER EXPLORATION OF TOLERANCE AREAS AND THE INFLUENCE OF OTHER DISPLAY VARIABLES Final Technical Report

Edward F. Rizy Sep. 1967 59 p refs
(RADC-TR-67-513; AD-659346)

Specification of primaries for seven-color display generation was examined under a wide range of contions, including modifications to the equipment, manipulation of environmental variables, and control of response variables. The basic purpose of this series of studies was to increase the precision of previously determined specifications for dichroic filters to be employed in additive multicolored large-scale displays. The upper tolerance limit for the blue dichroic filter was determined to a high degree of precision. In addition, questions of filter order, character size, and brightness contrast were examined experimentally to determine their influence on filter specification. As a summary contribution, an ideal seven-color additive system is outlined. Finally, recommendations are provided for situations wherein physical restrictions militate against the employment of the full seven color system approach. Author (TAB)

N68-10273# Army Medical Research Lab., Fort Knox, Ky. Pathology Div.

THRESHOLD LESIONS INDUCED IN PORCINE SKIN BY CO_2 LASER RADIATION Interim Report

Arnold S. Brownell, Wordie H. Parr, David K. Hysell, and Robert S. Dedrick 7 Jun. 1967 15 p refs
(AMRL-732; AD-659347)

The skin of white pigs was exposed to CO2 laser radiation with varying combinations of power density and exposure time. The dose-response relationship for threshold burns has been determined for power densities within the range of 1 to 8 watts/sq cm and exposure times 0.4 to 18 sec. In the range from 1.5 to 8 watts/sq cm the data fit the equation H = 4.13 t to the minus .607 power where H = incident power density (watts/sq cm) and t = median effective exposure time (sec). Limited data suggest that below 1.5 watts/sq cm this relationship changes. The data provide information for establishing safety standards for CO2 laser radiation. Author (TAB)

N68-10277*# Spacelabs, Inc., Van Nuys, Calif.

BIOLOGICAL SPECIMEN STORAGE FOR EXTENDED SPACE MISSIONS Final Report

1 Oct. 1967 56 p refs Prepared in cooperation with Bio-Sci. Labs., Inc.
(Contract NASw-1556)
(NASA-CR-90029; SR-67-1043) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Methods for preserving biological specimens for post-flight analysis are discussed and evaluated. Details are given on chemical, refrigeration, freezing, vacuum distillation, absorption and ion exchange, and lyophilization methods. Specimen collection and microbiological flora are considered. Lyophilization was found to be the most complex method, and to offer advantage only for LDH isozymes in serum and plasma. A freezer of 300 to 500 cubic inches and 15 to 22 pounds is recommended for blood, urine, serum, and plasma. The freezer could also be used for sweat and feces. It is also recommended that provision be made for obtaining dried blood smears on paper or glass for platelet count, reticulocyte count, and WBC differential. N.E.N.

N68-10339* American Inst. of Biological Sciences, Washington, D. C. Bioinstrumentation Advisory Council.

A STUDY OF POWER AND FREQUENCY REQUIREMENTS IN BIO-TELEMETRY

Frank J. Haahn 1 Jan. 1966 26 p
(Contracts NASr-132; Nonr-4526(04))
(NASA-CR-90064; BIAC-M2) CSCL 06B

The role of the Federal Communications Commission (FCC) in supervising and controlling the use of the electromagnetic spectrum is reviewed, as a prelude to discussing that portion of the biotelemetric technique which uses electromagnetic waves for transmitting measurement and control information. The impact of biotelemetric research on the life sciences is stressed, and its historical development is traced. The needs of biotelemetry and the rules of the FCC are examined in relation to the obvious conflict which exists. The detailed situations created by each different kind of biological application of telemetry are categorized as: local, confined radiation; local, unrestricted radiation; local, extended range radiation; area; regional; continental; international; and extraterrestrial. The lack of permissiveness towards telemetry in the FCC rules is pointed out, and the power and frequency requirements of biotelemetry are stated. A recommendation is made that the FCC be petitioned for a change in rule to permit biotelemetric transmissions under certain specified conditions and combinations of conditions. M.G.J.

N68-10356* American Inst. of Biological Sciences. Washington, D. C. Bioinstrumentation Advisory Council.
A SPECIAL REPORT ON BIO-TELEMETRY
Feb. 1965 45 p refs Repr.
(Contracts NASr-132; Nonr-4526(04))
(NASA-CR-90066; BIAC-M1) CSCL 06B

Several facets of biotelemetry are discussed in the context of the necessary collaboration between biologists and engineers. The potentialities of ecological biotelemetry are reviewed, worldwide active projects are surveyed, and an extensive bibliography on the subject is included. Field studies and experiments are reported on avian navigation, tracking grizzly bears, ruffed grouse behavior, and marine biotelemetry. Documented data are presented on the use of an advanced biotelemetering system to monitor the movement and behavior of wildlife under natural conditions. The automatic radio tracking system used is described, and the problems of data interpretation are considered. Technological developments are examined in relation to designing systems for the field and for physiological data; transmitter range and life predictions; and microelectronics and miniaturization. M.G.J.

N68-10367* Spacelabs, Inc., Van Nuys, Calif.
PHYSICAL METHODS FOR BIOCHEMICAL ANALYSIS IN SPACEFLIGHT Final Report
1 Oct. 1967 184 p refs Prepared in cooperation with Bio-Sci. Labs., Inc.
(Contract NASw-1556)
(NASA-CR-90032; SR-67-1044) CSCL 06A

The current instrumentation and techniques suitable for on-board space flight biochemical analysis are discussed. Several methods, such as flame photometry and centrifuges, were considered to be hazardous or to have adverse effects on the spacecraft. Techniques investigated are photometry, X-ray spectrometry, coulometric–amperometric titrimetry, gas–liquid chromatography, fluorometry, specific ion electrodes, neutron activation, and refractometry. Adaptability to simple handling by means of filter paper and cappillary tubes was emphasized. Normal human values, a brief description of photometric procedures, and an extensive bibliography are included. N.E.N.

N68-10381*# Serendipity Associates, Chatsworth, Calif.
A DESCRIPTIVE MODEL FOR DETERMINING OPTIMAL HUMAN PERFORMANCE IN SYSTEMS, VOLUME 4 Final Summary Report
Washington NASA Nov. 1967 51 p
(Contract NAS2-2955) CSCL 05H
(NASA-CR-879) CFSTI: HC $3.00/MF $0.65

This study was conducted to provide tools to aid in management decisions germane to the development of complex aerospace systems to the end that man be used in an optimal way. The study consists of five parts packaged in three reports and each part is focused on a particular area of concern to enable the necessary decision making, planning, and execution effort to be conducted. The reports are concerned with a simple model of a man–machine development cycle, a simple calculus for discrete systems, system development activities concerned with putting man in an aerospace system, some concepts and guidelines for developing man–machine systems, and an approach for determining the optimal role of man and allocation of functions in an aerospace system. The method by which the study was conducted is described in terms of 12 major tasks. Implications for future work are considered in detail. R.N.A.

N68-10395*# Miami Valley Hospital, Dayton, Ohio.
EFFECTS OF MINIMAL PERSONAL HYGIENE AND RELATED PROCEDURES DURING PROLONGED CONFINEMENT
A. R. Slonim Wright-Patterson AFB, Ohio AMRL Oct. 1966 32 p refs Prepared jointly with Fairchild Hiller Corp.
(NASA Order R-85; Contracts AF 33(657)-11716; AF 33(615)-1814)
(NASA-CR-90113; AMRL-TR-66-146; AD-659142) CSCL 06N

Thirty-six healthy male subjects were studied under closely confined conditions in nine 6-week experiments over a 2-year period. The effects of minimal personal hygiene and related procedures were evaluated. No major problems resulted from the lack of bathing, sponging the body, changing clothes and bedding. Body odor, strongest in axilla, groin, and feet, heightened in 7-10 days inside the AMRL Evaluator, but subsided in the second week. The absence of shaving and hair and nail grooming resulted in 25% of the subjects having to trim their mustache, 50% having to trim their fingernails at or after the fourth week, and dandruff and scalp itchiness in almost all cases. Of all restricted hygenic procedures, the use of substandard oral hygiene produced the greatest clinical effect, with all 20 subjects tested developing varying degrees of gingivitis. Limited hygiene during exposure to two 32 C periods produced no major but a number of minor problems associated with much dryness of skin and scalp. The types of microorganisms recovered from subject and environment as well as their characteristic buildup and spread over certain body areas under these minimal hygiene conditions are reviewed. Prolonged wearing of full pressure suits was well tolerated in most cases. Constant wearing of bioinstrumentation electrodes attached to the skin irritated all subjects tested. Seven different oral hygiene procedures and the efficacy of various waste management items, including different chemically-saturated wipes and fecal collectors, were evaluated. Author (TAB)

N68-10410# Naval Medical Research Inst., Bethesda, Md. Dept. of Behavioral Sciences.
PROJECT ARGUS 1967: FIVE YEAR REVIEW AND PREVIEW
William W. Haythorn Aug. 1967 60 p refs
(Rept.-31; AD-657862)

The report summarizes research progress under Project ARGUS for the period October 1965 to June 1967, and presents research plans for the five years 1968 - 1972. The accomplished research reported includes work on groups in isolation, social penetration, ecological aspects of behavior, sensory reduction, affect measurement, comparative monotony, activity measures, social comparison processes, behavioral contagion, Project SEALAB, expectancy confirmation, and stress. The report summarizes research described in more detail in 55 journal articles, chapters, and presentations to professional societies. The project plans for the

next five years envision continuing efforts in most of the above areas, with an increased emphasis on training, computer modelling, and larger isolated groups. Author (TAB)

N68-10435# Oklahoma Univ., Oklahoma City. Dept. of Dermatology.
PHYSIOLOGICAL RESPONSE OF HUMAN SKIN TO ULTRAVIOLET LIGHT
Mark Allen Everett and Robert L. Olson 20 Jul. 1967 9 p refs Presented at the 13th Intern. Congr. of Dermatol., Munich
(Contract AT(40-1)-3578)
(ORO-3578-2; CONF-670719-2) CFSTI: HC $3.00/MF $0.65

Recent research on uv-induced erythema provided much new data regarding the reaction of human skin to ultraviolet light. A review of the studies revealed that in the spectral range of 250 to 310 mμ, cutaneous erythema was directly wavelength dependent; the shorter the wavelength, the less the minimal erythema dose (MED). Time of day and interruption of the light beam does not affect resultant erythema. The energy required to produce erythema was significantly modified by such factors as anatomic location, angle of the incident light, thickness of the stratum corneum, time of observation, and size of the field of exposure. Author (NSA)

N68-10484# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. Protection Sanitaire.
RADIOACTIVE CONTAMINATION LEVELS IN THE ENVIRONMENT AND THE FOOD CHAIN [NIVEAUX DE CONTAMINATION RADIOACTIVE DU MILIEU AMBIANT ET DE LA CHAINE ALIMENTAIRE] Annual Report, 1966
Brussels EURATOM 1967 56 p refs In FRENCH; ENGLISH summary
(Contract EURATOM-003-63-10-PSAF)
(EUR-3553.f)

In human biology a special effort was made to determine anatomical data of European man and their evolution with age. The programme designed to study the metabolic factors of strontium and their evolution during growth has been set up. The estimation of food consumption and of its variation with age, with data from the dietary enquiries carried out in eleven regions, is nearly finished. Some results are available. Investigations on different factors of transfer of radioactive contamination from the polluted environment to food are being continued. Some results have been obtained from complementary experimental research. Various mathematical models concerning strontium metabolism have been studied. A method of calculating the critical age group from biological and nutritional data and from radioecological factors of transfer have been worked out. Finally, a programme investigating the distribution network of some of the most important foodstuffs in the six countries of the European Community has been initiated. Author

N68-10515# Cornell Univ., Ithaca, N. Y.
LENGTHS OF CYCLE TIMES IN RANDOM NEURAL NETWORKS
Neil James Alexander Sloane 15 Feb. 1967 173 p refs
(Contract Nonr-401(40); Grant NSF GP-971)
(Rept.-10; AD-659508)

The report contains a feasibility study of timing circuits for a model of the human brain. It is shown that certain random neural networks have cycle times which increase exponentially with the size of the network, and that these networks may be used as timing devices even for a period of time equal to a human lifetime. The methods used in this report are those of probability, combinatorial analysis, and number theory. Author (TAB)

N68-10522# Japan Atomic Energy Research Inst., Ibarakii
EFFECTS OF RADIATION ON THE CHROMOSOMES OF THE BONE MARROW CELLS
Noboru Ozono Mar. 1967 30 p refs Transl. into ENGLISH from Acta Haematol. (Karger), v. 28, no. 3, Jun. 1965 p 308–318 Submitted for publication
(NSJ-TR-78)

Chromosome studies were undertaken on the bone marrow cells of atomic bomb survivors in Hiroshima and of irradiated rats. No chromosome abnormalities in number or structure were found in 1968 bone marrow cells obtained from 39 individuals examined from 1962 to 1964 (16–19 years after exposure to the atomic bomb). Observations were made on the chromosomes of the bone marrow cells of rats at various intervals from three hours to ten months following 200 rads of X-rays, ^{60}Co γ rays, and 14.1-Mev fast neutrons. There were a number of chromosome abnormalities, a majority of which were chromatid aberrations, within three hours after irradiation. As time elaspsed the aberration rate fell rapidly, and stable chromosomal abnormalities such as pericentric inversions, chromosome deletions, and translocations were observed. Although frequencies of aberrant chromosomes were very low, they persisted ten months after irradiation. Morphological studies of the irradiated bone marrow indicated that most of the cells with chromosomal abnormalities observed shortly after irradiation originated from erythroblasts. Giant cells and multilobulated cells found 12–24 hours following irradiation were chiefly granulocytic. Author (NSA)

N68-10525*# General Electric Co., Philadelphia, Pa. Missile and Space Div.
A SURVEY OF IN VIVO ENERGY SOURCES
J. J. Konikoff Washington Am. Inst. of Biol. Sci. 1 May 1967 21 p refs
(Contract NAS2-1420)
(NASA-CR-90103) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Recent engineering advances in medicine have permitted the application of various protheses for the correction of physiological defects. Such devices as cardiac pacemakers, diaphragm stimulators, and artificial limbs have been greatly improved in effectiveness. Long term implants of electronic gadgetry have also become relatively commonplace in the biomedical community as a means for measuring several physiological parameters *in situ*. In both cases cited above, the power supply plays a vital role–because of its impact on the volume and life of the device. Although miniature batteries are doing an effective job in these applications, their two- or three-year life requires surgical procedure for replacement. To reduce this, other energy sources are being investigated. One approach is to use the body during its normal functioning to drive an electric power source. Bioelectric potentials, muscle motions, and implanted fuel cells are some of the approaches being investigated with varying degrees of success. (Another approach is to transmit the power through the skin by inductive coupling or in the form of radio frequency energy. This technique relieves the problems of battery life since the power pack is external and can be easily replaced.) Author

N68-10535*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Control Lab.
STUDIES OF HUMAN DYNAMIC SPACE ORIENTATION USING TECHNIQUES OF CONTROL THEORY
L. R. Young and Y. T. Li Jun. 1967 35 p refs
(Grant NsG-577)
(NASA-CR-89978; SASR-7) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Results for a series of man-vehicle control laboratory studies are summarized. Progress in developing a three-dimensional display system is discussed in detail. Preliminary experiments were conducted and a prototype three dimensional contact analog system was constructed in which the non-stereoscopic deflection and non-deflection depth cues alone were incorporated. The system consists of a computer generated CRT display of a cube, presented in perspective, with inverse square law line intensification. The cube appears as a solid object, as all lines leading to hidden vertices are blanked. The display operates continuously, showing an

updated scene thirty-two times per second. The pilot has full six degree of freedom control over the scene through simulated vehicle dynamics. Development status for an ultrasonic head position sensor for tracking the pilot's head motion is also discussed. E.C.

N68-10545# Oxford Univ. (England). Dept. of Zoology.
OSCILLATORY CONTRACTILE MECHANISM OF INSECT FLIGHT MUSCLE Interim Scientific Report, 1 Jul. 1966–31 Jul. 1967
J. W. S. Pringle 31 Jul. 1967 57 p refs
(Grant AF-EOAR-66-52)
(AFOSR-67-2253; AD-659463)

The flight muscles of giant water bugs provide the best material for a study of the peculiar properties of insect fibrillar muscle. Although little was previously known about the biology of these insects, three species, Lethocerus maximus, L. annulipes and B. Malkini have now been extensively studied in the field in Trinidad and the techniques for breeding L. maximus and B. malkini worked out. Against the background of studies carried out in Oxford in the last four years (Pringle, 1967) special attention was given to the biochemistry of the ATPase activity of actomyosin and myofibrils prepared from fibrillar flight muscles (Maruyama and Allen, 1967; Maruyama, Pringle and Tregear, in press). This enzyme is similar to that from vertebrate muscle in its sensitivity to ionic strength and its requirements for MgATP as substrate but its dependence on the concentration of Ca(2+) is different and this is related to the stretch activation shown by intact glycerinated muscle preparations (Ruegg and Tregear, 1966). Previous studies (Chaplain, 1966) suggested an important role for ADP in the control of ATPase activity of insect actomyosin. Further studies show that the ionic strength of the medium has an important effect on the inhibition or activation produced by ADP (Maruyama and Pringle, 1967). Author (TAB)

N68-10548# De Havilland Aircraft Co., Ltd., Malton (Ontario). Special Products and Applied Research Div.
BOOM ATTACHMENT SYSTEM Final Technical Report, 20 Jul. 1965–13 Sep. 1966
J. F. Haines, A. T. Woodford, B. Abbott et al Wright-Patterson AFB, Ohio AF Aero Propulsion Lab. Aug. 1967 87 p
(Contract AF33(615)-2724)
(AFAPL-TR-67-14; AD-659450)

The low gravity field environment experienced in space presents problems to astronauts attempting to perform work outside their spacecraft. This problem can be defined in part as the difficulty to maneuver and the difficulty to keep station relative to a surface on which work is being carried out. This is mainly due to the greatly reduced restraining forces available to a space worker, particularly the lack of friction force as a result of body weight reaction. To become effective in space, man must develop means of controlling reactions to work loads. Means have been studied to overcome this problem by restraint devices such as handholds, belts, and harnesses. Another means, and that which this report describes, is attachment to a work surface by rigid booms. A rigid boom attachment system offers a worker the advantage of being able to neglect the effect of moderate work loads. Design and development of an evaluation model of such a system using unfurlable booms—an application of de Havillands patented STEM (Storable Tubular Extendible Member) principle—was carried out by de Havilland along guide lines laid by the United States Air Force and within the restrictions of a limited budget. The developed system should prove of great use in narrowing the guide lines to an optimum system. Author (TAB)

N68-10551# Hazleton Labs., Falls Church, Va.
DEVELOPMENT OF THE FIREFLY BIOLUMINESCENT ASSAY FOR THE RAPID, QUANTITATIVE DETECTION OF MICROBIAL CONTAMINATION OF WATER Final Report, 1 May 1966–31 Mar. 1967
Gilbert V. Levin, Chi-sin Chen, and Gretchen Davis Wright-Patterson AFB, Ohio AMRL Jul. 1967 86 p refs
(Contract AF 33(615)-3996)
(AMRL-TR-67-71; AD-659144)

Research was conducted toward development of a sensitive, biologically nonspecific assay technique which uses the firefly bioluminescent reaction to detect ATP extracted from microorganisms present in water supplies. An instrument using a photomultiplier to detect the light output from the bioluminescent reaction was designed, constructed, and tested. Cultures of a wide variety of organisms were grown, both heterotrophic and autotrophic, and included numerous species of bacteria, algae, fungi, and protozoa. The tests demonstrated the ability to detect concentrations of only a few hundred cells of any of the test species and in many cases less than 100 cells in less than 30 seconds. The ATP response is related to number of cells and cell size and can be used as a measure of the number of cells per volume of sample if something is known of the cell size. Development of a differential filtering technique may be necessary to obtain highest accuracy in quantitation if cells of varying size are encountered. The inherent light level of the enzyme solution without ATP added varies from day to day and consequently the net response of the instrument gross response less inherent light - is the best measure of ATP level. The assay technique may have applicability to terrestrial water supplies - particularly under hazardous or difficult conditions as well as to spacecraft waters. TAB

N68-10558# Kansas State Univ., Manhattan. Inst. for Environmental Research.
HUMAN PHYSIOLOGICAL RESPONSES TO SHELTER ENVIRONMENT, SEPTEMBER 1965–NOVEMBER 1966
Frederick H. Rohles, Jr., Ralph G. Nevins, and Preston E. McNall, Jr. Feb. 1967 131 p refs Prepared for Army Dept.
(Rept.-2; AD-659403)

Three studies were conducted in simulated shelter environments. In Study A two experiments were conducted to determine the effects of subject-packing on changes in body temperature. Four pack conditions were studied using 8, 18, 32 and 48 subjects, respectively. In Experiment I the groups were exposed to 95, 98, 100 and 105F(DB) at 80%RH for 4 hours. Experiment II examined the physiological responses of these groups at 95 and 98F(DB) and 60, 70, 80 and 90%RH for 8 hours. The results of the first experiment supported the hypothesis that under crowded conditions the body temperature will rise faster than under less-crowded conditions. There is also support for this hypothesis in the second experiment; however, the results were not as conclusive. In Study B, experiments were conducted to establish upper limits non-stress shelter environments for men operating a Package Ventilation Kit (PVK). Eight subjects were exposed to DBTs ranging from 80F to 100F at 5F increments when the RH was 80%. Exposure was for a maximum of 8 hours and the subjects worked (pedaled) 15 minutes and rested 15 minutes. The upper limits of the non-stressful environments were: 90F DB at 0.05 hp/man; 85F DB at 0.10 hp/man; and 80F DB at 0.15 hp/man. The purpose of Study C was to determine the acceptability of stored water and to establish ad lib. water consumption at various thermal environments. Six 24 hour tests at ETs of 82.0, 85.0 and 88.0 were conducted with 3 groups of 8 male subjects. The results showed that the mean water intake was independent of the type of water. Author (TAB)

N68-10608# California Univ., La Jolla. Dept. of Aerospace and Mechanical Engineering Sciences.
TWO-DIMENSIONAL FINITE DEFORMATION EXPERIMENTS ON DOG'S ARTERIES AND VEINS
Jen-shih Lee, Wallace G. Frasher, Jr., and Yuan-cheng B. Fung Aug. 1967 35 p refs
(Grants AF-AFOSR-1186-67; PHS-G-HE-11152)
(AFOSR-67-1980; AD-659546)

Most published data on the blood vessel elasticity were obtained either in simple elongation or in simple inflation, but not simultaneously. For finite deformations, such data are insufficient to formulate a three-dimensional stress-strain law even if the material is isotropic and incompressible. Since the blood vessels are highly nonlinear, the Youngs modulus for a specimen varies continuously from almost zero at the undeformed state to a large final value, and a statement of the modulus without the corresponding stress level is meaningless. The purpose of the experiments reported in this paper is to illustrate a scheme remedying these difficulties. The tests consist of (1) a longitudinal stretching while the diameter of the vessel was maintained, (2) a lateral distension with the length of the vessel fixed, (3) stress relaxation at fixed strain, and (4) cyclic deformation. Two Lagrangian stresses (stresses based on the vessels undeformed state) and two extension ratios are used to describe the deformed state of the vessel under a symmetric loading. The nonlinearity in the elasticity, and the dependence of the stress on the strain-history is demonstrated. Author (TAB)

N68-10616 Joint Publications Research Service, Washington, D. C.
PHYSIOLOGICAL MECHANISMS OF THE ACTION OF ACCELERATIONS
A. A. Sergeyev 22 Nov. 1967 438 p refs Transl. into ENGLISH of "Fiziologicheskiye Mekhanizmy Deystviya Uskoreniy" Leningrad, Nauka Publ. House, 1967 p 1–391
(JPRS-43412) CFSTI: $3.00

Based on experimental data on the effect of accelerations, the question of whether there is any limit to the speed which can be tolerated by the human body is examined. Acceleration concepts are discussed in relation to the three types of accelerations known in mechanics: positive linear acceleration; negative linear acceleration, or deceleration; and radial or centrifugal acceleration. The physiological and pathological phenomena experienced by different systems of the body under acceleration stress are considered, and the capacity of man for physiological adaptation to environmental conditions by means of compensatory mechanisms is evaluated. Emphasis is focused on the various aspects of the mechanisms for imparting linear accelerations; and the physiological mechanisms of radial acceleration effects, and acceleration effects during space flights. An extensive bibliography is included M.G.J.

N68-10620*# Midwest Research Inst., Kansas City, Mo.
MEDICAL APPLICATIONS OF AEROSPACE SCIENCE AND TECHNOLOGY Quarterly Report, 1 Aug.–31 Oct. 1967
16 Nov. 1967 58 p refs
(Contract NASr-63(13); MRI Proj. 3077-E)
(NASA-CR-90026; QR-2) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Work efforts were conducted on (1) the successful application of NASA spray electrodes to the recording of electrocardiograms on children undergoing exercises; (2) the measurement of oxygen and carbon dioxide during respiration; (3) a photographic technique for body cavities; (4) an impedance cardiograph system, (5) a blood pressure measuring system, and (6) a chronic intracranial pressure measurement procedure. Measurements of tremors and muscle reflexes; cranial nerve potentials; bone distortion; microcirculation; muscle heat; temporomandibular joint action; brain waves; eyeblink; body motion; infant motor activity; and electric field effects on living cells, were also made. Other miscellaneous activities concerning medical problems are also described. L.S.

N68-10628* Public Health Service, Cincinnati, Ohio.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Jul.–30 Sep. 1967
Robert Angelotti Oct. 1967 14 p refs
(NASA Order R-36-015-001)
(NASA-CR-90097; QPR-10) CFSTI: $3.00 CSCL 06M

The dry heat resistance of Bacillus subtilis var. niger spores on stainless steel strips was detemined. D values at 115°, 125°, and 135°C were obtained and a z_D value calculated. In addition, a thermal death time curve for spores trapped between mated surfaces at 150 inch-pounds of torque was plotted from D values reported in the Ninth Quarterly Report of Progress. A z_D value was determined from the curve and reported. Finally, the effect of water activity on the thermal resistance of spores was investigated. In this system, spores were dried on glass and exposed to various water activities prior to heating. Results from these experiments substantiated earlier findings indicating that intermediate water activities increase dry heat resistance of spores. Author

N68-10632# Sandia Corp., Albuquerque, N. Mex.
LASER EYE HAZARD EVALUATIONS
W. D. Burnett Aug. 1967 18 p refs
(SC-RR-67-563) CFSTI: HC $3.00/MF $0.65

Equations for calculating direct laser intensity levels on the human retina are described and related to so-called safe retinal intensity levels extracted from a review of current literature. Author (NSA)

N68-10645*# Miami Valley Hospital, Dayton, Ohio.
EFFECTS OF EXPERIMENTAL DIETS AND SIMULATED SPACE CONDITIONS ON THE NATURE OF HUMAN WASTE
A. R. Slonim and H. T. Mohlman (Dayton Res. Inst.) Wright-Patterson AFB, Ohio AMRL Nov. 1966 33 p refs Prepared jointly with Dayton Univ. Res. Inst.
(NASA Order R-85; Contracts AF 33(657)-11716; AF 33(615)-2182)
(NASA-CR-90114; AMRL-TR-66-147; AD-659143) CSCL 06K

The effects of three different types of experimental diets and three environmental conditions on the nature of human waste were evaluated in a series of experiments over a 2-year period to provide waste management criteria for space systems. These effects were assessed in 36 healthy subjects in terms of defecation rate, fecal mass, protein, fat, fiber, and physical characteristics, along with some urine properties and water consumption. Dehydrated foods, full pressure suits, strict confinement and heat stress (32 C) did not alter any of the waste properties. The liquid foods under examination caused a significant but not consistent increase in fecal mass. The greatest effect of diet was observed with compressed bite-sized food, resulting in a significant ($P < 0.01$) and persistent increase in fecal fat and mass as well as a change to a soft fecal consistency. This steatorrhea condition plus the high correlation of fat between experimental diet and feces emphasize the importance of selecting the proper quality of fat in the diet. Differences between and within subjects were observed. Time differences and interactions varied according to experimental design or condition; these differences plus some degree of carry-over in feces from one diet into another diet period stress the importance of having adequate adjustment periods before evaluation of diets. Other characteristics of the diet were evaluated also. Of all the experimental conditions studied, only heat stress caused a very significant change in water consumption. Author (TAB)

N68-10648* Aerospace Products Research Corp., Santa Monica, Calif.
COMPUTER DRIVEN ELECTROLUMINESCENT VERTICAL SCALE INDICATOR
James A. Pellegrino and Jules L. Rosenbaum Washington NASA Nov. 1967 40 p
(Contract NAS7-420)
(NASA-CR-919) CFSTI: $3.00 CSCL 09B

The effort expended in the design, development, and fabrication of two types of solid-state digitally controlled electroluminescent vertical scale indicators is outlined. One type is a single parameter indicator which employs one bargraph, with scale and parameter

indication; and the other is a flight director which uses two adjacent bargraphs, with scale and parameter indication. The delivered indicators met all of the following specification requirements: fast dynamic response compatible with the SDS 920 Computer update-time capability of one to twenty milliseconds; automatic lamp brightness regulation; absence of glow, flicker, and cross-coupling in the lighted display; use of high-contrast display techniques; interchangeability and versatility compatibile with an instrument used in laboratory simulations; multicolor display capability; internal information storage; low power consumption, capable of operating at 2.5 watts. The objectives for simulator environments were met with the exception of temperature. Some difficulty was encountered in isolating problems which appeared under dynamic operation of the instruments. Author

N68-10683# Technology, Inc., San Antonio, Tex. Life Sciences Div.

RESEARCH ON OCULAR EFFECTS PRODUCED BY THERMAL RADIATION Final Report, 1 Jul. 1966–30 Jun. 1967

Ralph G. Allen, Jr., William R. Bruce, Kenneth R. Kay, Larry K. Morrison, Robert A. Neish et al Jul. 1967 157 p refs

(Contract AF 41(609)-3099)

(AD-659146)

Chorioretinal burn thresholds for rabbits were determined for 66 various combinations of exposure durations and retinal image diameters. The criterion for burn damage was the appearance of an ophthalmoscopically visible lesion 5 minutes after the flash exposure. Exposure durations ranged from 165 microsec to 100 sec and the range of image diameters was from 0.053 mm to 1.08 mm. The thresholds were based on an average of 9 eyes per condition. Burn thresholds were also determined for rhesus monkeys. Exposure durations from 4 to 250 msec and image diameters from 0.11 to 1.30 mm were employed for the threshold determinations. Fluorescein angiographs were investigated as a means for the detection of chorioretinal damage below the level of the ophthalmoscopically visible lesion. In an area of moderate damage there is rapid fluorescence which was interpreted to be the result of an increase in capillary permeability. A ruby laser was adapted for further studies on chorioretinal burns in rabbits and primates. And a flashblindness testing apparatus for measuring visual recovery times for human subjects was constructed and tested. TAB

N68-10696 Joint Publications Research Service, Washington, D. C.

WIDE APPLICATION OF BIONICS OUTLINED

V. V. Parin 24 Nov. 1967 11 p Transl. into ENGLISH from Morskoi Sb. (Moscow), no. 9, 1965 p 32–37

(JPRS-43439) CFSTI: $3.00

An historical note deals with the application of bionics to other scientific disciplines, and research in biology is considered as a guideline for channeling allied research activities. Cybernetics is referred to as ushering in a new period in the development of science, wherein there has begun a synthesis of the various branches of knowledge. Presently, bionics is in its infancy, with efforts directed at systematization and consolidation of efforts toward solving engineering problems. Mention is made of computer applications and the wide range of problems that lend themselves to bionics research. M.W.R.

N68-10734# RAND Corp., Santa Monica, Calif.

AIRCREW RATIO STUDIES

A. J. Gross Sep. 1967 51 p refs

(Contract F44620-67-C-0045; Proj. RAND)

(RM-5385-PR; AD-659132)

The memorandum describes a probabilistic model that can be used both as a planning factor and as an evaluation procedure in allocating aircrews to squadrons. Ordinarily, aircrew ratios are determined from prior experience such as number of scheduled flying hours per crew, average number of missions per day, and average number of aircraft per mission. These factors are incorporated with the time allocation of aircrew personnel to various tasks, including flying, to derive an aircrew ratio for a squadron during a flying period. The probability model utilized the above factors as primary inputs. The outputs are graphs showing the probability that a particular squadron meets a required mission objective as a function of the crew ratio. The model is also used to measure the effect of a constant aircrew ratio as the number of aircraft per mission is varied. In essence, by applying the model one is able to determine the probability that a squadron of k planes will simultaneously fly a given mission if there are k + s crews available to fly it; i.e., if the crew ratio is (1 + s/k). Author (TAB)

N68-10776# Human Engineering Labs., Aberdeen Proving Ground, Md.

A BEHAVIORAL STUDY OF THE SOUND-SHADOW EFFECT IN IMPULSE NOISE

Davod C. Hodge and R. Bruce McCommons Jul. 1967 23 p refs

(TM-12-67; AD-659331)

The sound-shadow effect of the human head in an impulse-noise field was studied by exposing 27 subjects to gunfire noise so their left ears were normal to the oncoming shock wave (near ear) and their right ears were protected by the shadow of the head (far ear). Noise exposure was continued until the subjects near ear demonstrated 15 dB temporary threshold shift (TTS) and the post-exposure TTS in near and far ears was compared. Peak pressure level at the entrance of the far ear canal was less than one-half that found at the near ear (153 vs. 161 dB re 0.0002 microbar). Mean TTS was significantly smaller in the far ears than it was in the near ears. The mean protection afforded the far ear by the heads shadow ranged from three dB at 1 kHz to 12 dB at 6 kHz. The implications of the findings for the protection of weapon crewmen are discussed. Author (TAB)

N68-10808# School of Aerospace Medicine, Brooks AFB, Tex.

TEMPERATURE-SENSING TELEMETRY SYSTEM FOR UNRESTRAINED RHESUS MONKEYS *(MACACA MULATTA)*

Henry Buchanan, Jere M. Phillips, Alfredo Lopez, and Willis F. Moore Jul. 1967 11 p refs

(SAM-TR-67-63; AD-659365)

The temperature-sensing telemetry system consists of three implanted transmitters (each with its own antenna system and receiver), a scanner to sample in sequence each receiver output, a frequency counter, digital recorder, and tape punch unit. The scanner, synchronized with the digital recorder, permits temperature recording from each of the three transmitters once every 5 minutes. The implant is an FM/FM (frequency-modulated subcarrier/frequency-modulated transmitter) telemetry unit operating in the 88 to 108 MHz broadcast band. Thermistors are used as temperature sensors. Printed circuit boards are used for component interconnection and antenna; mercury batteries are used for power. The sensor, radio frequency transmitter, and batteries are embedded in an epoxy case. Before implantation the unit is calibrated in a water bath over the temperature range of 34 to 42C. The system has been used to automatically record, digitally and continuously, temperature measurements of three unrestrained rhesus monkeys (Macaca mulatta) for a period of 5 weeks. Author (TAB)

N68-10809# School of Aerospace Medicine, Brooks AFB, Tex.

THE EFFECTS OF MONOMETHYLHYDRAZINE UPON RENAL FUNCTION

Frederic L. Coe, Robert W. Howe, and James A. Goetting Jul. 1967 7 p refs

(SAM-TR-67-61; AD-659721)

The toxicology of alkylhydrazine derivatives has been extensively studied by the Air Force because of the use of these

compounds in rocket propulsion systems. The present study deals specifically with the effects of monomethylhydrazine (MMH) upon renal function in dogs. The effects of monomethylhydrazine upon renal excretion of sodium, potassium, and water are those of a weakly diuretic agent. When administered intravenously to dogs, it produces modest increases in ion and water excretion unassociated with concomitant increase of glomerular filtration rate. Selective intrarenal infusion does not produce a significant ipsilateral diuresis. The mechanism responsible for the diuretic action of MMH is not known. Author (TAB)

N68-10810# School of Aerospace Medicine, Brooks AFB, Tex.
F-106B AIRCRAFT FLASHBLINDNESS EXPERIMENT
Albert V. Alder and James E. Hamilton Jul. 1967 7 p refs
(SAM-TR-67-41; AD-659718)

A study was conducted to obtain quantitative performance data from the effect of flashblindness upon aircraft control and to measure the visual recovery time from flashblindness during a series of flights in the F-106B aircraft. A Strobonar 65c flashlamp was mounted in the rear cockpit of the aircraft beneath a lightproof, buggy-top canopy in order to produce flashblindness under simulated nighttime conditions. Aircraft attitude and recovery time were monitored by the safety pilot, two cameras, and the aircrafts tactical airborne recording package. The effect of flashblindness on aircraft control and recovery time for flashblindness are discussed in relation to similar previous studies performed in aircraft simulators. Author (TAB)

N68-10818# Naval Medical Research Inst., Bethesda, Md.
ELECTRICAL ACTIVITY OF RECEPTORS, ASSOCIATED WITH MAINTENANCE OF FLIGHT, IN THE LOCUST [ELEKTRICHESKAIA AKTIVNOSTI REPSEPTOROV SVISZANNYKH S PODDERZHANIEM POLETA, U SARANCHI]
V. L. Sviderskii 1967 9 p Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 172, no. 5, 1967 p 1230–1233
(NMS-TRANS-2036; TT-67-62584; AD-656919)

The studied locust receptors are mechanoreceptors which, by the nature of their response, somewhat resemble certain tactile receptors in the paws of the fly. The essential factor for the activation of the receptor is the static shifting, and not the vibration of the cilium which occurs during its subjection to blowing of air. These receptors belong in the group of slowly adapting receptors and the final frequency of the order of 50-70 imp/sec, apparently, is adequate for the maintenance of the active state of the system which controls the flight of the insect. Author (TAB)

N68-10825# Human Engineering Labs., Aberdeen Proving Ground, Md.
GROWTH OF TEMPORARY THRESHOLD SHIFT FROM IMPULSE NOISE: A METHODOLOGICAL STUDY
David C. Hodge and R. Bruce McCommons May 1967 39 p refs
(TM-10-67; AD-659330)

An experiment was performed (a) to validate a procedure for determining the growth rate of temporary threshold shift (TTS) from impulse-noise exposure and examine the range of TTS growth rates occurring in a sample representative of the Army population; and (b) to see how binaural and monaural impulse-noise exposure differ in their effect on TTS growth rate. Thirty-nine subjects were exposed to 155 db peak-level gunfire impulses until they demonstrated 15 db TTS2 at 2, 4, or 6 KHz. The results showed that (a) fewer impulses should be administered at the beginning of a test session to better estimate the shape of the TTS growth function; and (b) binaural exposure to impulse noise, under the conditions employed in this study, did not result in consistently faster or slower rates of TTS growth than monaural noise exposure. Author (TAB)

N68-10830# FMC Corp., Santa Clara, Calif.
DEVELOPMENT OF A GENERAL PREDICTION METHOD FOR TRANSCRIPTION ERROR RATE Technical Report, 15 Jan.–30 Jun. 1967
Richard L. Hawley, Anne Melby, and Bruce N. McArthur Wright-Patterson AFB, Ohio ASD Jun. 1967 108 p refs
(Contract F33615-67-C-1361)
(R-2595; ASD-TR-67-7; AD-659449)

This study develops a General Prediction Method (GPM) for estimating the human error rate in a data transcription system. It also indicates the nature of the relationships between error rate and the significant determinants, and it specifies the relative importance of these relationships. Correlation and stepwise regression analyses are performed on data gathered in previous laboratory experiments in obtaining the desired results. The following factors are investigated for their influence on human error rate: Operator Age, Education, and Occupation; Transcription Methods; Code Length, Content, Mix, and Repetition; Code Blocking and Order; Grouping within Codes; Response Format; and Duration of Work Period. The following factors have the greatest influence: Code Length, Content, Transcription Method, and Repetition. The following have less influence: Sex, Age, Occupation, Duration of Work Period, Response Format, Education, Grouping within Codes, Code Blocking and Order. It is recommended that the GPM be validated by application to operational data systems and refinement made in operational settings where those factors found relatively unimportant in this study would be eliminated enabling easier application of the GPM. Author (TAB)

N68-10834# Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.
ADAPTATION TO A HOMOCHROMATIC VISUAL WORLD
Jo Ann S. Kinney and Jane C. Cooper 28 Jul. 1967 13 p refs
(SMRL-499; AD-659496)

In a simulation of the underwater visual world, subjects adapted to a diffuse visual field of blue-green light and, for a control, a field of red light. Measures were then made both of the shift in color appearance of objects and of the subjects speed of reacting to these shifted colors. The amount of change in the appearance of colors was sizable, easily accounting for the reports sometimes made by SEALAB divers, who said they could see yellows and reds when there were none present. There was, however, no change in the subjects speed of reacting to the colors. Author (TAB)

N68-10845# College de France, Paris. Inst. Marey.
NERVOUS PROCESSES UNDERLYING BEHAVIOR AND LEARNING Final Scientific Report, 1 May 1966–30 Apr. 1967
A.-E. Fessard 30 Apr. 1967 15 p refs
(Grant AF-EOAR-66-45)
(AFOSR-67-2272; AD-659549)

Abstracts are presented on the following experiments: Cutaneous nerve fibers involved in a stable defensive reaction; Cortical controls on a stable defensive reaction in cats; Modifications of evoked potentials in thalamus during auditory conditioning in cats; Subcortical structures and learning in rats; Thalamic retention of engrams for a conditioned escape reaction in functionally decorticated rat brains; Brain structures involved in a delayed alternation task in monkeys; Paradoxical phase of sleep and cortico-subcortical controls; Double origin of the inhibition exerted on the extra-lemniscal afferent messages; and Multi-modal projections to the claustrum in the cat brain. TAB

N68-10848 Kernforschungsanlage, Juelich (West Germany). Arbeitsgruppe Institut fuer Zoologie.
LIFE OBSERVATIONS AND ELECTRON MICROSCOPIC INVESTIGATIONS OF THE NEW FORMATION OF MITOCHONDRIA IN CULTURED CHICKEN HEART CELLS [LEBENDBEOBACHTUNGEN UND ELEKTRONENMIKROSKOPISCHE UNTERSUCHUNGEN DER NEUENTSTEHUNG VON MITOCHONDRIAN IN GEZUECHTETEN HUEHNERHERZZELLEN]
Ernst Wendt and Dieter Schaefer Jun. 1967 21 p refs In GERMAN; ENGLISH summary
(JUL-492-ZO) CFSTI: $3.00

In irradiated and unirradiated chicken heart myoblasts cultivated in vitro, the formation of mitochondria was studied by means of phase contrast and electron microscopy. Phase constrast observations of the living object 6 to 7 hours after irradiation with 2400 R found functionally active mitochondria decreased: subsequently there appeared in the cytoplasm numerous small spherical pre-mitochondria which soon increased in number and developed into mitochondria of normal size and structure. Results with the electron microscope showed that the endoplasmic reticulum produced buds considered as young pre-mitochondria. Later on, in limited areas, the spherical pre-mitochondria show the typical arrangement of cristae mitochondriales and simultaneously increase in length. Therewith the pre-mitochondria assume a club-shaped form, the spherical portion of which is filled with a dense ground-substance. This ground-substance obviously produces the material for further formation of cristae mitochondriales which accompanies the outgrowth of the mitochondrial tube. Thus the pre-mitochondria transform into definitive mitochondria. Author

N68-10855*# Battelle Memorial Inst., Columbus, Ohio.
ENGINEERING REQUIREMENTS FOR CULTURING OF HYDROGENOMONAS BACTERIA
John F. Foster and John H. Litchfield [1967] 8 p refs
(Contracts NASr-100(03); NAS2-4270)
(NASA-CR-90111) CFSTI: HC $3.00/MF $0.65 CSCL 06M

Experimental results obtained with a continuous culture system for the cultivation of *Hydrogenomonas eutropha* for waste management in a life-support system indicate that a reliable and stable system can be designed under the present state-of-the-art. The present system provides for control of hydrogen, oxygen, carbon dioxide, pH, cell density, temperature, urea, and ammonia during growth. The culture system design is adaptable to operation in a zero-gravity field, and should be adaptable to integration with proposed water electrolysis and product recovery systems for waste management in an overall life support system. Author

N68-10881# Army Missile Command, Huntsville, Ala.
TOLERANCE PHILOSOPHY
William E. Keeling Jun. 1967 40 p
(AD-816406) CFSTI: HC $3.00/MF $0.65

The report is designed to establish the interdependency of test equipment tolerance limits to other parameters of system design and to establish a general tolerance philosophy. Included is a graphical development of tolerance philosophy and a derivation of applicable tolerance handling formulas. The central theme of the report proves that test equipment tolerance is a dependent function of a parameter called delta sigma and is basically unrelated to the item under test tolerance. This theme is then expanded to include other elements necessary to establish an overall tolerance philosophy for use by the Government, contractors, and designers. Also included are some of the relationships of mathematical tolerance manipulation to the laws of distribution probability, particularly as they relate to the incorrect presumptions currently employed. Author (TAB)

N68-10911 Osterreichische Studiengesellschaft für Atomenergie G.m.b.H., Seibersdorf (Austria). Institut fuer Biologie und Landwirtschaft.
ANALYSIS OF n-ACTIVATION AND ITS APPLICATION POSSIBILITIES IN VETERINARY, HUMAN, AND FORENSIC MEDICINE [n-AKTIVIERUNGSANALYSEN UND IHRE ANWENDUNGSMOEGLICHKEITEN IN TIER-, HUMAN- UND GERICHTSMEDIZIN]
H. Altmann 1967 20 p refs In GERMAN Submitted for publication
(SGAE-BL-21/1967) CFSTI: $3.00

Main emphasis in medical activation analytical methods centers on the determination and registration of single trace elements in different organs and cell structures. Changed element concentrations and combinations in pathological processes are easily determined for thyroid functions, liver damage, cancer research, some dental decay problems, etc. Applications of neutron activation analyses in forensic medicine are steadily increasing; arsenic content location in hair establishes time and dosage of poison intake; powder residues on hands and clothing of suspect persons can be identified. Also important are identification analyses for narcotics, traffic accident debris, pesticide poisonings, and various industrial and nuclear research plants. Transl. by G.G.

N68-10914# Kernforschungsanlage, Juelich (West Germany). Zentralbibliothek.
COMPILATION OF LITERATURE ON THE NUCLEAR SCIENCES [LITERATURZUSAMMENSTELLUNGEN AUS DEN GEBIETEN DER KERNWISSENSCHAFTEN]
E. Paul, comp. May 1967 26 p refs In GERMAN
(JUL-BIBL-7) CFSTI: HC $3.00/MF $0.65

This literature survey on nuclear science publications covers the following aspects: biology and medicine, chemistry, technology, radiation shielding and safety, instrumentation, isotope technology, metal, ceramic and other materials, physics, reactor technology, and some general and different subjects. Transl. by G.G.

N68-10988# Sandia Corp., Albuquerque, N. Mex.
USE OF RESPIRATORS AND METHODS OF DETERMINING FACE FIT
A. Juskiewicz and C. P. Skillern Aug. 1967 11 p
(SC-RR-67-461) CFSTI: HC $3.00/MF $0.65

The methods that are used for determining face fit for respiratory protective devices at Sandia Laboratory are described. Individuals are tested, after their threshold for amyl acetate has been determined, in a room containing a known concentration of amyl acetate. The penetration between the mask and the face is determined by using this information. The criteria for mask issue are given with cleaning and maintenance procedures. Author (NSA)

N68-10993 Osterreichische Studiengesellschaft für Atomenergie G.m.b.H., Seibersdorf (Austria). Institut fuer Biologie und Landwirtschaft.
CHANGES IN THE COMPOSITION OF FREE NUCLEOTIDES IN YEAST AFTER GAMMA-IRRADIATION [VERAENDERUNGEN IN DER ZUSAMMENSETZUNG DER FREIEN NUCLEOTIDE IN HEFE NACH GAMMA-BESTRAHLUNG]
G. Stehlik, H. Altmann, and K. Kaindl 1967 17 p refs In GERMAN; ENGLISH summary Submitted for publication Supported in part by Bundesmin. fuer Handel, Gewerbe und Ind.
(SGAE-BL-22/1967)

Saccharomyces cerevisiae var. *ellipsoideus* was gamma-irradiated at a dose of 0.3 × 10_6 rad ^{60}Co. $^{32}PO_4^{-3}$ was incorporated at different times after irradiation. The free nucleotides were isolated and separated to determine their metabolism-dependent synthesis, modification or degradation. The

most noticeable change was the decrease in adenosine triphosphate (ATP) and the increase in adenosine monophosphate (AMP). The group transferring co-enzymes also showed an alteration. Author

N68-11008* Texas Inst. for Rehabilitation and Research, Houston.
USE OF EXTREMITY CUFFS AS A CARDIOVASCULAR REFLEX CONDITIONING TECHNIQUE
Fred B. Vogt Mar. 1967 232 p refs
(Contracts NSR-44-024-006; NAS9-1461; NAS9-5821; Grant NIH FR-00254)
(NASA-CR-90248) CSCL 06P

Tilt table study and plasma volume data are presented on the Gemini V and VII astronauts who participated in the cardiovascular reflex conditioning experiment. Ground-based experimental results are also included to indicate the effect of extremity cuffs in the simulated flight conditions of water immersion and bedrest. A cuff inflation–deflation cycle of 2 minutes on, 4 minutes off was used 24 hours a day during orbital flight. An effective inflation pressure of 80 mm Hg to the cuffs was utilized; it took approximately 10 seconds for inflation of the cuff and 10 to 12 seconds for deflation once the pressure source was removed. Based on the data analyses, it was concluded that no significant protection against cardiovascular deconditioning associated with bedrest of water immersion experiments, or with space flight, can be attributed to the use of intermittently inflated extremity cuffs. M.G.J.

N68-11019*# California Univ., Los Angeles. Research Div.
SMALL GROUPS AND THE PREDICTION OF BEHAVIOR
Fred Massarik Sep. 1967 19 p refs
(Grant NGR-05-007-090)
(NASA-CR-90247; NASA-RP-22) CFSTI: HC $3.00/MF $0.65 CSCL 05J

Major modes of interpersonal prediction, managerial style in prediction process, and an integrative mode to improve interpersonal predictive outcomes are discussed. Experiential, normative, and research predictions are described. Parallel and separatists modes of dealing with small groups from the manager's vantage point are outlined. An integrative learning/teaching model is suggested that is based on multivariate problems which are socially relevant and interplay among the many forces affecting the small group behavior. N.E.N.

N68-11020*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
DEVELOPMENT OF PROTOTYPE MASS MEASUREMENT SYSTEM FOR SPACEFLIGHT, PHASE II
R. B. Maine and A. L. Weitzmann 9 Nov. 1967 75 p
(Contract NAS1-7135)
(NASA-CR-66479) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Based on the principle of the simple harmonic motion of an oscillating mass, coupled with the precise timing of the oscillations, a prototype mass measurement system (MMS) was designed and fabricated. The conventional ball bearing cluster carriage assembly was used, together with a pallet assembly designed to meet the structural requirements of the 2.5 g loads imposed when flying the zero gravity parabola. Details are given on the inanimate and man restraint systems, and on the otolith threshold measurement techniques. Tests of rigid masses from 5 to 250 pounds, and of three human subjects, proved accurate, and the MMS was converted into the acceleration threshold measurement configuration and test flown using two subjects. The results indicate that the device can determine man's threshold to accelerations in the area of 5 cm/sec^2 in the zero gravity environment. M.G.J.

N68-11035*# California Univ., Berkeley. Space Sciences Lab.
CHEMISTRY OF LIVING SYSTEMS Semiannual Report, Apr. 1–Sep. 30, 1967
Thomas H. Jukes 30 Sep. 1967 35 p refs *Its* Space Sci. Lab. Ser. 8, Issue 91
(Grant NsG-479)
(NASA-CR-90308) CFSTI: HC $3.00/MF $0.65 CSCL 06B

Brief reports are presented on biochemical research projects. Studies are described on DNA replication and RNA polymerase; chemical and optical properties of nucleic acids and proteins; sequential studies of spinach and chromatium ferredoxins, and thermolysin; function and structure of bacterial ribosomes; formation of bacteriophage T4; regulation of nucleoside metabolism; bacteriophage internal proteins; and action of various mutagens on TMV and TMV-RNA. N.E.N.

N68-11042# Technology, Inc., San Antonio, Tex. Life Sciences Div.
THE INVESTIGATION OF THE PARAMETERS OF HEAD INJURY RELATED TO ACCELERATION AND DECELERATION Final Report, 1 Jul. 1964–30 Jun. 1966
Lawrence S. Higgins, Robert A. Schmall, Clarence P. Cain, Philip E. Kielpinski, Frank P. Primiano, Jr. et al Jun. 1967 111 p refs
(Contract DA-49-193-MD-2610)
(TI-118-67-1; AD-659795)

The report describes the results of a three year program in experimental head injury. During this period a highly successful head accelerating device was evolved. Major features of this machine include the application of a reproducible non-deforming stimulus to the head through a controlled path. A series of head acceleration experiments were conducted with this machine. Graded stimuli from no effect through concussion to lethality were found possible without deformation of the skull. Because of the reproducible acceleration waveform produced by this machine, statistical ranking of clinical signs of concussion is possible and is reported. From these experiments, clinical data as well as gross pathological findings are summarized. Detailed design criteria for the head accelerator are included in this report, as well as the associated instrumentation. Conclusions regarding the engineering and physiological findings are followed by recommendations for further work. Author (TAB)

N68-11050# Florida Univ., Gainesville.
EFFECTS OF PROLONGED STAGE FOUR AND 1-REM SLEEP DEPRIVATION: EEG, TASK PERFORMANCE, AND PSYCHOLOGIC RESPONSES
Robert L. Williams, H. W. Agnew, Jr., and Wilse B. Webb Brooks AFB, Tex. School of Aerospace Med. Jul. 1967 17 p refs Submitted for publication
(Contract AF 41(609)-2907)
(SAM-TR-67-59; AD-659764)

Two experiments are described which demonstrated the effects of extended stage 4 sleep deprivation and separately the effects of 1-REM sleep deprivation. Measurements of the sleep EEG and measurements of personality variables revealed that these two types of sleep deprivation are quite different. Stage 4 deprivation resulted in a sharp increase in stage 2 on deprivation nights while 1-REM deprivation resulted in an increase in stage 1 without rapid eye movements. Stage 4 deprivation produced a depressive psychologic profile in the subjects while 1-REM deprivation resulted in a state of increased irritability and emotional lability. TAB

N68-11065* Texas Inst. for Rehabilitation and Research, Houston. Medical Center.
THE USE OF TILT TABLE STUDIES TO EVALUATE CARDIOVASCULAR DECONDITIONING OF SPACE FLIGHT
Fred B. Vogt Mar. 1967 120 p refs
(Contract NSR-44-024-006; Grant NIH FR-00254)
(NASA-CR-90251) CSCL 06S

An evaluation is made of tilt table studies performed in association with the Gemini space flights which describe the cardiovascular deconditioning associated with space flight. The analysis and interpretation of the data is based on experience from extensive tilt table studies performed in association with water immersion, bedrest, and chair rest deconditioning experiments. The study shows that cardiovascular deconditioning, as evidenced in heart rate and blood pressure response to the tilt procedure, does occur in association with space flight. The deconditioning may be due to changes in several physiological systems. There is no strong evidence of space flight time dependence in producing the deconditioning. There is an apparent difference in cardiovascular deconditioning of bedrest, water immersion, and space flight. The occurrence of syncope was no greater after period of space flight deconditioning than for a normal population undergoing other experimental circumstances. No single measure or index was derived which can express an individual's specific tilt table response in relation to his normal response, or to the response of a population. R.N.A.

N68-11078# School of Aerospace Medicine, Brooks AFB, Tex.
MOL: PREDICTING FOUR-HOUR LEVELS OF PSYCHOMOTOR PERFORMANCE FROM THE INITIAL HALF HOUR
Bryce O. Hartman Jun. 1967 15 p Submitted for publication
(SAM-TR-67-55; AD-660103)

Four subjects participated in an MOL-like nutrition study using freeze-dehydrated, bite-sized Apollo food. The two experimental subjects were confined in a small (300 cu. ft.) altitude chamber operated at 27,000 feet with an atmosphere of 70% oxygen and 30% helium. Psychomotor testing was conducted in 4-hour sessions three times a day, every other day, alternating with two control subjects. No major psychomotor changes were observed, except on the short-term memory task, which appeared to reflect motivational factors. Correlations between the first half hour and the remainder of the testing session ranged from -.21 to +.96 and were scattered across that range. It was concluded that a daily half-hour psychomotor test of space crews is probably not sufficiently stable to meet biomedical monitoring requirements. Author (TAB)

N68-11090# General Electric Co., Binghamton, N. Y. Avionic Controls Dept.
A BLENDED FEEDBACK VARIABLE FOR CONTROL AUGMENTATION SYSTEMS Technical Report, May 1966–Apr. 1967
Donald T. Makers Wright-Patterson AFB, Ohio AF Flight Dyn. Lab. Aug. 1967 40 p refs
(Contract AF 33(615)-5371)
(ACD-8317 AFFDL-TR-67-87; AD-659753)

A man-airframe disturbance sensitivity model has been postulated. The existence of optimum pilot chosen compensation in the multiloop compensatory mode is shown to result in minimum closed loop sensitivity to pilot induced stick input errors. Based on existing fixed base simulator data it is shown that an optimum ratio exists for blended feedback control of pitch rate and normal acceleration. Author (TAB)

N68-11097# Naval Personnel Research Activity, San Diego, Calif.
THE APPLICATION OF DECISION THEORY AND SCALING METHODS TO SELECTION TEST EVALUATION
Ervin W. Curtis Feb. 1967 112 p refs
(STB-67-18; AD-659961)

The correlational approach to selection test evaluation was examined and found to have serious limitations. An approach based on statistical decision theory was developed. Two new methods were presented, one called the utility function method and the other the decision-theoretic method. The former involves the comparison of criterion groups in terms of their utility to the institution using the selection test. The decision-theoretic method is based on statistical decision theory and involves the construction of a payoff matrix corresponding to the contingency table relating the test to the criterion. The cell frequencies are weighted in a utility equation by the payoff values in the corresponding cells of the payoff matrix. This utility equation represents a new test evaluation index which directly expresses the utility of the test to the institution using it. Both of these new methods require the measurement of values peculiar to the institution using the test. The utility function method requires that the performance criterion be translated to a utility function; while the decision-theoretic method requires that a payoff matrix be developed which reflects the gains and losses each cell observation represents to the institution. The three methods (correlational, utility function, and decision-theoretic) were compared with tests used to select students for A-Schools in the U.S. Navy. The three methods led to quite different indications regarding the utility of the selection tests evaluated. The two new methods agreed in terms of the proportion improvement over chance prediction provided by the tests while the correlational method tended to underestimate this proportion. TAB

N68-11141*# Pennsylvania State Univ., University Park. Physiology Labs.
INTESTINAL ABSORPTION OF RADIOIODIDE IN RATS EXPOSED TO HYPOXIA (380 MM HG) AND FOOD DEPRIVATION
Peter F. Pearson and Adam Anthony Sep. 1967 45 p refs Sponsored by Natl. Inst. of Gen. Med. Sci. and NIH
(Grants NGR-39-009-015; PHS GM-05112)
(NASA-CR-90307) CFSTI: HC $3.00/MF $0.65 CSCL 06R

Hypoxia effects on gastrointestinal absorption of orally administered radioiodide and the extent of its influence on circulating and thyroidal iodide levels were investigated. Two experiments were performed using adult male Holtzman rats. In the first, 12 rats were placed in a decompression chamber for 24 hours while 12 controls were kept at ambient pressures. Both groups were fed *ad libitum*. In the second experiment, 24 rats were deprived of food for 24 hours; 12 of these were then subjected to hypoxia for 24 hours while the remaining 12 were kept at ambient pressure as food-deprived controls. In all instances, 0.2 μc NaI-131 was given orally 24 hours before killing the rats. In both experiments, hypoxic rats had more food and radioiodide remaining in the stomach than ambient pressure controls, indicating hypoxia causes a delay in the movement of gastric food and iodide into the intestine. Food deprivation alone had no effect on gastric or intestinal levels of radioiodide, indicating no appreciable impairment in iodide absorption. Circulating levels of radioiodide were comparable in control and hypoxic rats despite a lowered intestinal absorption in hypoxic animals. This was partly due to an hypoxia-induced reduction in urinary excretion of radioiodide. E.C.

N68-11164# Ohio State Univ., Columbus. Human Performance Center.
INFLUENCE OF PROLONGED VIEWING OF LARGE-SCALE DISPLAYS ON EXTRACTION OF INFORMATION Final Report, May 1966–May 1967
William A. Johnston and William C. Howell Griffiss AFB, N. Y. RADC Sep. 1967 66 p refs
(Contract AF 30(602)-4307)
(RADC-TR-67-411; AD-660115)

Six experiments were conducted in an effort to systematically appraise the effects of selected variables on sustained attention to a complex display. The goal was to isolate task conditions yielding poor or unstable monitoring performance, and to assess the feasibility of overcoming these detrimental effects by modifying the characteristics of the display. The investigation of task variables revealed that either a slow rate of signals or a low ratio of relevant to irrelevant signals is likely to yield inferior monitoring performance. The manipulation of display variables under these undesirable task

conditions indicated that the inhibitory effect of low signal frequency can be combated by making the stimulus codes dissimilar and by using a high-quality display, and that the deleterious effect of a low ratio of relevant to irrelevant signals can be minimized by making the irrelevant stimulus codes dissimilar and, in some cases, by using a high-quality display. TAB

N68-11167* Detroit Univ., Mich. Dept. of Behavioral and Neurological Sciences.
THE ANALYSIS OF GEMINI 7 EEG DATA BY THREE DIFFERENT COMPUTER ORIENTED METHODS
[1967] 56 p refs
(Contract NSR-23-003-005)
(NASA-CR-90235) CSCL 06S

The problem in assessment of electroencephalograms has been the subjective element in visual evaluation of such records as well as the need for extensive training (2 to 3 years) before a suitable candidate is capable to perform this task. There have been a variety of computer type analyses of EEG during the past ten years or more, and we are still searching for a reliable, inexpensive, on-line data processing procedure for this task. We are aware our Soviet colleagues are routinely using computer assessment of EEGs, using relatively inexpensive hardware. In our report we endeavor to show how four different assessment procedures (visual assessment, zero crossings technique, smoothing and peak counting technique, and Weibull Statistic) may be utilized, and indicate the advantages and disadvantages peculiar to each. We wish to point out that in the Gemini 7 EEG analog records supplied to the Henry Ford Hospital, Channel II (mid-line central to mid-line occipital electrodes) could not be assessed reliably after approximately 26 hours of flight. Channel I (left central to left occipital electrodes) provided the more assessable EEG up to approximately 54 hours of flight. These channels were compared during the first 26 hours of flight, and no significant difference was found by our various assessment procedures. We, therefore, have limited this report to the findings on the analyses of Channel I during its approximate 54 hours of recording. Author

N68-11177# Pisa Univ. (Italy). Istituto di Fisiologia.
COMPARATIVE NEUROPHYSIOLOGY OF THE VISUAL SYSTEM Final Scientific Report, 15 Sep. 1966–14 Sep. 1967
Giuseppe Moruzzi 14 Sep. 1967 11 p refs
(Contract F61052-67-C-0028)
(AFOSR-67-2354; AD-659763)

The following themes were investigated: Reticular influences on the lateral geniculate body; Peripheral inhibition of flashing in fireflies; Influence of background illumination on the electrical responses of the cats retina to flashes of light; Dark adaptation and equivalent background responses in the cats retina; The electroretinogram of the pigeon; Visual receptive fields of callosal units; Interactions between callosal and geniculo-cortical inputs to the visual cortex. TAB

N68-11178*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
STUDY OF LIFE SUPPORT SYSTEMS FOR SPACE MISSIONS EXCEEDING ONE YEAR IN DURATION, PHASE A. VOLUME 1: ANALYSIS OF NEW CONCEPTS Final Report
R. B. Jagow, ed. 15 Dec. 1967 154 p refs
(Contract NAS2-3818)
(NASA-CR-73158) CFSTI: HC$3.00/MF$0.65 CSCL 06K

Methane, methanol, glycerol, and hydrocarbons were studied as candidates for microbial life support systems for space missions exceeding one year. The need for more desirable algal and hydrogenomonas strains was investigated, as were the use of radioisotope phosphors for illumination of algae, chemical synthesis of fats and proteins, formaldehyde synthesis using chromatographic reactors, and glycerol synthesis using acetylene as an intermediate. Animal links in a man–plant–animal closed system were considered, as well as the use of biological wastes for propulsion and radiation shielding. Waste regeneration, waste incineration, and chemical synthesis of food in the closed system were considered. M.W.R.

N68-11203# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF PROCESSES OF CONTROL IN LIVING ORGANISMS AND PATHS OF CREATION OF NEW CYBERNETIC SYSTEMS [ISSLEDOVANIYA PROTSESSOV UPRAVLENIYA V ZHIVYKH ORGANIZMAKH I PUTI SOZDANIYA NOVYKH KIBERNETICHESKIKH SISTEM]
M. A. Khvedelidze 5 Sep. 1967 44 p refs Transl. into ENGLISH from Tr. Kibernetiki Inst., Akad. Nauk GRuzSSR (USSR), v. 1, 1963 p 169–190
(FTD-MT-66-66; TT-67-63233; AD-660409)

A short survey is offered of work in the field of investigations of control processes in living organisms and applications of the knowledge gained to the solution of engineering problems: improvement of existing machines and systems, and creation of essentially new ones. Author (TAB)

N68-11212# Naval Air Development Center, Johnsville, Pa.
MATHEMATICAL MODEL OF SKIN EXPOSED TO THERMAL RADIATION
John A. Weaver and Alice M. Stoll 22 Aug. 1967 34 p refs
(NADC-MR-6708; AD-659973)

Prediction of dermal injury resulting from exposure to thermal energy of any given intensity and duration depends entirely upon the resultant skin temperature-time history. Means are now available for assessing heat transfer by low temperature radiation, convection and conduction to the bare skin and through thin protective coverings of known physical properties. However, thermal effects of nuclear detonations constitute a special problem because much of the radiation lies in the visible range where the optical properties of the skin and its coverings, if any, greatly influence the heating pattern. Blackening of the skin eliminates effects due to its optical properties but enhances the ever-present variations in the thermal constants of the skin. The present report describes the utilization of a mathematical equation and computer techniques for extracting these variations from empirical data obtained at relatively low levels of radiation (<0.5 Cal/sq cm sec.), and applying extrapolations of these values in calculations of temperature-time histories at higher levels of irradiance where empirical data are lacking. This procedure is subject to validation by experimentation within a limited range of exposures. If validation is achieved in the blackened skin then the entire system may be utilized in the determination of optical properties of unblackened skin. Author (TAB)

N68-11224* Texas Inst. for Rehabilitation and Research, Houston.
BLOOD VOLUME STUDIES IN ASSOCIATION WITH GEMINI SPACE FLIGHTS
Fred B. Vogt Mar. 1967 70 p refs
(Contract NSR-44-024-006; Grant NIH FR-00254)
(NASA-CR-90234) CSCL 06S

Preflight and postflight plasma volume and red cell mass measurements on Gemini astronauts are evaluated. Single 15 minute mixed isotope samples were used. The measurements were primarily recorded to determine the effects of prolonged flights. The astronauts were weighed preflight and postflight, urine volume measurements were taken during flight, and tilt table studies were performed preflight and postflight. Comparisons are made between blood volume and hematocrit changes in individual astronauts and data on ground-based subjects. A literature survey on blood volume changes during experimental studies on normal subjects is also presented. E.C.

N68-11236 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PROBLEMS OF ENGINEERING PSYCHOLOGY

P. I. Zinchenko, ed., V. P. Zinchenko, and B. F. Lomova 25 Jan. 1967 360 p refs Transl. into ENGLISH of the book "Problemy Inzhenernoy Psikhologii" Leningrad, Akad. Ped. Nauk RSFSR, 1965 p 1–223

(FTD-HT-66-220; TT-67-63239; AD-660414)

CONTENTS:

N68-11237 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AN EXAMINATION OF MEMORY IN CONNECTION WITH THE TASKS OF ENGINEERING PSYCHOLOGY [ISSLEDOVANIYE PAMYATI V SVYAZI S ZADACHAMI INZHENERNOY PSIKHOLOGII]

P. I. Zinchenko and V. P. Zinchenko *In its* Probl. of Eng. Psychology 25 Jan. 1967 p 2–27 refs (See N68-11236 02-05)

The authors discuss the role of memory processes in the activities of operators of automatic control systems. In the context of engineering psychology, matching the working characteristics of the human operator with the characteristics of automated systems is essential. Further progress in production automation and the construction of control systems will open up more and more possibilities for transferring a number of functions previously carried out by man to the machine. The first problem with respect to memory has been formulated in a study of the structure of mnemitic activity (V. Ya. Lyaudis). The results of working out this problem might be not only a necessary prerequisite for, but also a definite stimulus to further improvement of memory storage systems. Author

N68-11238 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MEMORY CAPACITY AND AMOUNT OF INFORMATION [OB'YEM PAMYATI I KOLICHESTVO INFORMATSII]

P. B. Nevel'skiy *In its* Probl. of Eng. Psychology 25 Jan. 1967 p 28–166c refs (See N68-11236 02-05)

The author discusses information and memory, the concept of memory capacity, the relation of memory capacity to the number of symbols to be remembered, and whether memory capacity depends on the amount of information. He discusses experiments with artificial concepts and deals with memory capacity in equally probable appearance of symbols from different alphabets; memory capacity, amount of information, and number of symbols; and memory capacity in the case of equally probable appearance of symbols of one alphabet. Experiments with words and a brief survey of memory capacity studies is also given. Two paths of reprocessing information in human memory are discussed. Author

N68-11239 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF THE OPERATIVE MEMORY [ISSLEDOVANIYA OPERATIVNOY PAMYATI]

G. V. Repkina *In its* Probl. of Eng. Psychology 25 Jan. 1967 p 167–237 refs (See N68-11236 02-05)

The operative memory is a necessary component of any activity. The characteristics of the operative memory depend on the purposes and tasks of the activity being served. Operative memory units are formed in the process of mastering the activity. The accumulated processes of mnemitic treatment of the material directly connected with the formation of perceptive and thought operations, lie at the basis of the formation. The latter can serve as a basis for the formation of the operative memory units only at that level of their development when they are subject to contraction and automation. New processes of operative mnemitic treatment of the material are accumulated in the process of mastering the activity. The basic path of the formation of the operative units consists of conversion of purposefully directed actions into automatic operations. Determination of the principles of the formation of the operative memory units is a condition for high quality of the learning. Author

N68-11240 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME METHODS OF INFORMATION CODING [O NEKOTORYKH SPOSOBAKH KODIROVANIYA INFORMATSII]

N. I. Ryzhkova *In its* Probl. of Eng. Psychology 25 Jan. 1967 p 238–253 refs (See N68-11236 02-05)

According to the experimental data obtained by a number of investigators, the effectiveness of coding is determined by many factors: by the choice of the symbol alphabet, by the nature of the task being resolved by the human operator, by the degree of compatibility of the symbol alphabet and the information being coded and others. The effectiveness of coding in relation to the factors indicated has usually been studied in connection with the characteristics of perception processes. Memory in such studies was represented almost exclusively by the recognition process. However, the effect of these and other factors on the effectiveness of information coding in connection with the characteristics of the functioning of such complex memory processes as remembering and reproduction remains almost unstudied. Author

N68-11241 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE STRUCTURE OF MNEMITIC ACTIVITY [O STRUKTURE MNEMICHESKOGO DEYSTVIYA]

V. Ya. Lyaudis *In its* Probl. of Eng. Psychology 25 Jan. 1967 p 254–302 refs (See N68-11236 02-05)

This article deals with the study of the structure of mnemitic activity. An experiment was conducted to study the relationship of remembering to the structure of material being remembered. Results given in the article make it possible to believe that the composition of the mnemitic activity which has been noted gives a functional characterization of the remembering process. The resolution of a mnemitic task represents a system of actions connected with organization of the material for purposes of subsequent reproduction. The analysis which has been made confirms the idea expressed in Soviet psychology of memory. Author

N68-11242 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

GENESIS OF THE OPERATIONS OF THE MNEMITIC EFFECT [K VOPROSU O GENEZISE OPERATSIY MNEMICHESKOGO DEYSTVIYA]

L. M. Zhitnikova *In its* Probl. of Eng. Psychology 25 Jan. 1967 p 303–317 refs (See N68-11236 02-05)

This article deals with an investigation directed toward a study of the process of formation of the mnemitic effect in children of preschool age during learning. The formation of the mnemitic effect in the classification process was studied. It was shown in many papers that grouping of material in various forms (semantic grouping, composition of a plan, etc.) is the most important method of remembering, and classification represents one type of grouping. Author

N68-11243 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CERTAIN CONDITIONS FOR THE RATIONAL USE OF MEMORY DURING TRAINING [O NEKOTORYKH USLOVIYAKH RATSIONAL'NOGO ISPOL'ZOVANIYA PAMYATI V PROTSESSE OBUCHENIYA]
V. V. Repkin and G. K. Sereda *In its* Probl. of Eng. Psychology 25 Jan. 1967 p 318–326 refs (See N68-11236 02-05)

Memory is one of the most important mental processes responsible for the mastery of skills, and therefore it plays an extremely important role during training. This article attempts to characterize some of the conditions for the organization of effective training, including operator training. Author

N68-11246# Navy Electronics Lab., San Diego, Calif. Center for Command Control and Communications.
HUMAN BIOLOGICAL INTERACTIONS WITH LASER LIGHT Research Report, Nov. 1966–May 1967
T. O. Huston 2 Aug. 1967 36 p refs
(NELC-1502; AD-660361)

The report discusses the effect of laser light on the human body, particularly the eye. It includes calculations of the results to be expected for some common commercial gas lasers. Emphasis is placed upon low power lasers which are the most frequently mishandled. Author (TAB)

N68-11265*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
THE DISPERSION AND DISSIPATION OF WAVES IN BLOOD VESSELS
James A. Maxwell and Max Anliker May 1967 115 p refs Sponsored in part by NASA
(Contract DA-31-124-ARO(D)-233; Grant NSFGK-47)
(NASA-CR-90377; SUDAAR-312; AD-659787) CFSTI: HC $3.00/MF $0.65 CSCL 06P

Dispersion and dissipation phenomena associated with waves propagating in blood vessels are potential measures of the distensibility of the vessels and other cardiovascular parameters. In this investigation we assume the vessels to behave like thin-walled circular cylindrical shells filled with an inviscid compressible fluid. The vessel wall is assumed to have isotropic and homogeneous viscoelastic properties. The waves are described by small three-dimensional displacements of the middle surface of the shell from an equilibrium configuration defined by a mean transmural pressure and an initial axial strain. The fluid motion associated with the waves is considered as irrotational. The linearized differential equations of motion are based on the shell equations derived by Flugge. Author (TAB)

N68-11283* Lockheed Missiles and Space Co., Sunnyvale, Calif.
STUDY OF LIFE SUPPORT SYSTEMS FOR SPACE MISSIONS EXCEEDING ONE YEAR IN DURATION, PHASE 1A. VOLUME 2: MISSION STUDIES
R. B. Jagow, ed. 15 Dec. 1967 156 p refs
(Contract NAS2-3818)
(NASA-CR-73159) CSCL 06K

New concepts for use of metabolic wastes in closed life support systems were examined for application to a model Earth orbiting space station, lunar base, and interplanetary vehicle. The processing of metabolic wastes for use as radiation shielding, propulsion propellants, extravehicular life support system expendables leakage makeup gases, and starting materials for biological or chemically synthesized food were studied. Systems using these concepts were configured and compared for each model mission. The use of wastes for radiation shielding, EVA expendables, and food leakage makeup were found to be very competitive with *Hydrogenomonas* and glycerol food synthesis systems for all missions. The use of wastes for propulsion and the baseline system using stored food and dumping wastes to space ranked low in the comparison studies. Author

N68-11289# Human Engineering Labs., Aberdeen Proving Ground, Md.
A PRELIMINARY STUDY OF SOME VARIABLES AFFECTING PULSED-TONE BEKESY THRESHOLDS
R. Bruce McCommons and David C. Hodge Aug. 1967 19 p refs
(TM-14-67; AD-659806)

The study was performed to determine the effects of varying the period and duty cycle of a pulsed tone on the sensitivity and variability of Bekesy thresholds at several test frequencies. Ten subjects were tested using 36 combinations of these variables. It was determined that threshold sensitivity improves both with longer periods and with higher duty cycles, and that lengthening the period adversely affects intratest variability. Frequency was ruled out as a significant variable. The effects of temporal auditory summation and repetition rate of the pulses as determinents of these results are discussed. Author (TAB)

N68-11290*# Miami Valley Hospital, Dayton, Ohio.
COMPARISON OF ORGANOLEPTIC ACCEPTABILITY OF LIQUID AND FRESH DIETS
Vickie R. Must, Carol A. Linder, Dorathea P. Dunco, Keith J. Smith (AMRL), and Elwood W. Speckmann (AMRL) Wright-Patterson AFB, Ohio AMRL Jun. 1967 16 p refs Presented at the 48th Ann. Meeting of the Am. Dietetic Assoc. Cleveland, 1–5 Nov. 1965
(NASA Order R-85; Contract AF 33(657)-11716)
(NASA-CR-90379; AMRL-TR-65-179; AD-660136) CFSTI: HC $3.00/MF $0.65 CSCL 06H

Data on the organoleptic acceptability of a liquid diet formula with a variety of flavors and two other diets composed of fresh foods was obtained from eight subjects during two, forty-two day experiments. An analysis of the acceptability ratings permits the following conclusions to be made: (a) Even when variety is limited, the acceptability of a fresh food diet is considerably higher than the acceptability of a liquid formula when given as the sole source of nutriment. (b) The bittersweet chocolate-flavored beverage was preferred over the other flavors. (c) Differences inherent among individuals cause statistically significant variation in food acceptability ratings. (d) Over an extended period of time, monotony may be overcome by incorporating a liquid formula into a diet composed primarily of solid foods. This approach merits further investigation. Author (TAB)

N68-11325# School of Aerospace Medicine, Brooks AFB, Tex.
DEFINITION OF SPACE FLIGHT MEDICAL KITS: A RATIONALE
James F. Wittmer Jun. 1967 20 p
(AMD-TR-67-1; AD-659761)

A systematic approach to the identification of on-board medical therapeutic items for manned space flight is described. Included are a resume of the mission-spacecraft-crew specific factors to be considered, and a discussion of the correlative process

needed to assess and integrate the many variables involved. The rationale is illustrated by data from a study using the described techniques, the requirement having been the definition of medical kit items for a manned space flight of several weeks duration. Author (TAB)

N68-11337# RAND Corp., Washington, D. C.
THE CHROMATICITIES OF SUBJECTIVE COLORS ELICITED BY ROTATION OF THE FECHNER–BENHAM DISC
Guy Verriest and Ryo Seki Oct. 1967 17 p refs Transl. into ENGLISH from Rev. D'Optique Theorique et Instrumentale (Paris), v. 43, 1964 p 53–63
(P-3682; AD-660102)

The subjective colors obtained by the rotation of a Fechner-Benham pattern were matched against the Munsell book of colors. The main series of measurements was obtained under a C source providing an illumination of 1700 1x and the data have been converted into values for Y, x and y and also into values for lambda sub d and P sub e. TAB

N68-11380*# Texas Inst. for Rehabilitation and Research, Houston.
BONE DENSITY AND CALCIUM BALANCE STUDIES ON PROJECT GEMINI
Fred B. Vogt Mar. 1967 113 p refs
(Contract NSR-44-024-006; Grant NIH FR-00254)
(NASA-CR-90218) CFSTI: HC $3.00/MF $0.65 CSCL 06P

An attempt is made to evaluate and relate bone density, calcium balance, and nitrogen balance studies that were performed in association with Gemini space flights to observations made from ground-based studies. Experiments are described in which data were obtained on the effects of space flights of up to 14 days duration on the skeletal and muscular systems. Appendices are included which cover (1) a bone densitometer assembly for measurements of roentgenographic bone density, (2) reproducibility of an X-ray bond densitometry technique, (3) human evaluation of a chemical urine volume and measurement system, and (4) calcium balance in association with a 30 day bedrest study. C.T.C.

N68-11383# Army Medical Research Lab., Fort Knox, Ky. Experimental Psychology Div.
VISUAL-VESTIBULAR INTERACTION AND THRESHOLD FOR ANGULAR ACCELERATION Final Report
John E. Marshall 10 Oct. 1967 12 p refs
(USAMRL-754; AD-660287)

Subjective response latencies from 36 Ss were used as an index of threshold across four intensities of angular acceleration (1.5, 3, 6, and 12 degrees/sec sq.) under three different visual conditions. These included total darkness (D), a simple, structured visual environment which rotated with S(LA), and a homogeneous, illuminated visual field (L). The results indicate that while illumination of the structured visual field lowers subjective threshold for angular acceleration, its differential effect is reduced with increased acceleration intensities. Visual field articulation enhances threshold sensitivity when compared with darkness, but not when L X LA comparisons are made. Author (TAB)

N68-11393# John Tracy Clinic, Los Angeles, Calif.
RESEARCH IN SENSORY THRESHOLD MEASUREMENT Final Report
Edgar L. Lowell 15 Sep. 1967 49 p refs
(Contract Nonr-3397(00))
(AD-660011)

The report describes studies of auditory threshold with a special purpose average response computer. The first section describes the development of the equipment used in early phases of the study. Three special purpose analog computers are described, and block diagrams provided. The second section summarizes a number of unpublished studies. They detail the effects of various stimulus parameters upon the shape of the evoked waveform; tone bursts produce greater amplitude than clicks; low frequency tone burst produce greater amplitude than high frequency tone bursts; increasing the intensity of the tone bursts, increases the amplitude and decreases the latency of the response. These findings illustrate the difficulty of establishing any fixed response criteria. Under optimum conditons, evoked potentials are obtainable to within 10 or 20 dB of most subjects subjective response threshold. Instructions or tasks which increase the subjects attention to the auditory stimuli increase both amplitude and latency. A third section describes a study of a large, negative potential that is present when the auditory stimulus is given information bearing properties. This wave was described, by Grey Walter, as a Contingent Negative Variation. This study was conducted with 40 institutionalized mentally retarded patients who presumably would have had some difficulty in forming the necessary association. The Contingent Negative Variation was present in 20 Mongoloids, but absent in 20 patients with unknown etiology. Author (TAB)

N68-11396# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
SYMPOSIUM ON RELIABILITY OF HUMAN PERFORMANCE IN WORK
William B. Askren, ed. May 1967 51 p refs Ann. Conv. of the Am. Psychological Assoc. held in New York, 5 Sep. 1966
(AMRL-TR-67-88; AD-659140)

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3. APPLICATIONS OF HUMAN RELIABILITY TO THE PRODUCTION PROCESS D. Meister (Bunker-Ramo Corp.) p 33–45 refs (See N68-11399 02-05)

N68-11397# American Inst. for Research, Pittsburgh, Pa. Inst. for Performance Technology.
CLASSIFICATION OF HUMAN ERROR
James W. Altman *In* AMRL Symp. on Reliability of Human Performance in Work May 1967 p 3–16 refs (See N68-11396 02-05)

Alternative ways of classifying human error to facilitate integration of error data for reliability estimates useful to psychologists, are examined. Performance orientation is treated with respect to 1) the coding of errors to the phases of activity (system functions, subsystem loci, tasks, or individual actions), 2) classification of errors according to some general set of process categories, 3) classification at a more general or macroscopic level, and 4) classification according to areas of skill and knowledge content. L.S.

N68-11398# Sandia Corp., Albuquerque, N. Mex. Systems Reliability Div.
SOME LIMITATIONS IN USING THE SIMPLE MULTIPLICATIVE MODEL IN BEHAVIOR QUANTIFICATION
Alan D. Swain *In* AMRL Symp. on Reliability of Human Performance in Work May 1967 p 17–31 refs Sponsored by AEC (See N68-11396 02-05)

Some practical limitations in using the simple multiplicative model with a molecular definition of behavioral elements to estimate task reliability in man–machine systems, are discussed. Advantages of estimating conditional probabilities of molar units of behavior when using the probability tree technique in reliability analysis, are described. A Monte Carlo simulation of the molecular approach using the simple multiplicative model is presented, and the use of these results in probability trees is discussed. Results indicate that

a molar approach is more practical than a molecular approach. When using the simple multiplicative model, interaction effects should be taken into account. But if these effects are taken into account by estimating conditional probabilities of larger units of behavior, then these larger units can be represented by branches in a probability tree diagram and the Product Rule can be used for each success path. L.S.

N68-11399# Bunker-Ramo Corp., Canoga Park, Calif.
APPLICATIONS OF HUMAN RELIABILITY TO THE PRODUCTION PROCESS
David Meister *In* AMRL Symp. on Reliability of Human Performance in Work May 1967 p 33–45 refs (See N68-11396 02-05)

The importance of production worker error to system reliability, and ways in which workmanship error and its causes may be detected and investigated, are discussed. Characteristics that differentiate production error from operating error are noted; and factors that predispose to worker error are analyzed in the context of the production process as a man–machine system. L.S.

N68-11423# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF DISTANCE AND POSTURE OF OBSERVER ON THE PERCEPTION OF SIZE
Chi-cheng Ching, Jui-hsueng Peng, and Yun-chiu Fang 28 Apr. 1967 31 p refs Transl. into ENGLISH of Hsin Li Hsueh Pao, no. 1, 1963 p 20–30
(FTD-HT-67-162; TT-67-63242; AD-660442)

Under normal observation conditions, the size perception constancy of the observer with regard to an object has the tendency to shrink with the increase in the viewing distance. It, however, does not shrink proportionally with the increase in the distance. Using a subjective attitude of observation, the size perception of the object is, in general, smaller than complete invariance (actual size) values. Only a few individual observers display an overestimation phenomenon regarding the perceptual size of the object. The observation postures, prone, supine or bending backward affects the size perception of the observer. It tends to shrink the perceptual size. The prone postures of the observer has more prominent effect on his size perception. Proning 90 degrees has greater effect than proning 45 degrees. In other words, when the body prones forward in making the observation, the object appears smaller and when the angle of forward proning is greater, the objects appear smaller. The effect on perceptual size is the greatest when the observation is made in a bending backward posture. The perceptual size of the object becomes markedly smaller. Author (TAB)

N68-11508# Stanford Univ., Calif. Biophysics Lab.
INDUCTION EFFECTS IN EPR SIGNAL I IN ALGAE
Ellen C. Weaver 1 Aug. 1967 10 p refs Presented at Conf. on Comp. Biochem. and Biophys. of Photosynthesis, Hakone, Japan, 12–15 Aug. 1967
(Contract AT(40-3)-326-12)
(SU-326P12-8) CFSTI: HC $3.00/MF $0.65

The kinetics of the appearance of EPR Signal I in whole cells parallel those for the oxidation of P_{700} and cytochrome. Electron parametric resonance spectroscopy of wild type algae was found to allow the study of the photoreactive center I without interference from overlapping pigments, since the detecting microwave radiation does not itself affect any photosynthesis processes. Author (NSA)

N68-11510*# Webb Associates, Yellow Springs, Ohio.
THE PRINCIPLE OF THE SPACE ACTIVITY SUIT
Paul Webb and James F. Annis Washington NASA Dec. 1967 34 p refs
(Contract NAS1-6872)
(NASA-CR-973) CFSTI: HC $3.00/MF $0.65 CSCL 05B

This paper describes in principle a Space Activity Suit (SAS) designed for an active astronaut working in a vacuum for up to four hours. The suit will consist of a powerful elastic net leotard combined with positive pressure breathing via helmet and trunk bladders. Under the terms of the present contract, an elastic sleeve-and-glove was constructed to demonstrate the principle of the full SAS suit. Subjects wore the garment in an arm chamber which produced negative pressures up to 200 mm Hg (8 in Hg). Exposures to near-vacuum conditions were accomplished in an altitude chamber where the total pressure was 155 mm Hg and the arm chamber pressure was 5 to 8 mm Hg. The near-vacuum exposure for 20 minutes produced no evidence of gaseous swelling; arterial and venous circulation was adequate; mobility and finger dexterity were excellent; increase in arm volume from accumulation of tissue fluid was approximately 5%. The successful demonstration of principle indicates that a full SAS can be developed. As an alternative to gas-filled pressure suits, its advantages would be: improved mobility, flexibility, and dexterity at small metabolic cost; simplicity in approach; low risk to the astronaut if the netting is torn; and physiological temperature regulation without power or cooling machinery. Author

N68-11541# Applied Research Lab., Waltham, Mass.
FONT RECOGNITION Final Report
Peter A. Belmont Griffiss AFB, N. Y. RADC Oct. 1967 108 p ref
(Contract AF 30(602)-4066)
(F-6161-1; RADC-TR-67-348; AD-660125)

The need to design multifont print-readers is becoming critical as the volume of typewritten material received by various government agencies and the need to encode it for use by computers grow. The present study assumes the possibility of designing excellent single-font print-readers and studies the question of combining several of them to form one multifont print-reader. In this research, human font recognition is studied, and unaided font recognition is looked into. Several cooperative methods, in which the input document must be specially marked to facilitate font recognition, are studied, and one is studied extensively and simulated on the GE-635 computer. The latter method required the input document to display six characters--g, y, 1, 3, 4, 5--by inspection of which positive identification can be made for all of the 21 fonts studied. Author (TAB)

N68-11623# Istituto Superiore di Sanita, Rome (Italy). Laboratori di Fisica.
ELEMENTARY PHYSICAL PRINCIPLES OF TRANSPORT PERTAINING TO IONIC SYSTEMS, SEMICONDUCTORS AND ELECTROPHYSIOLOGICAL MEMBRANES
Alexander Mauro (Rockefeller Univ., N. Y.) 3 Jul. 1967 72 p refs Lextures held at Ist. Super. di Sanita, 3–14 Jul. 1967
(ISS-67/19) CFSTI: HC $3.00/MF $0.65

These lectures give the theoretical background for the understanding of the ionic transport phenomena through electrophysiological membranes. The subject is dealt with in terms of analogy between ionic and semiconductor systems. First two different theoretical approaches to describe the equilibrium state are shown, and the way of measuring the potential differences in ionic systems is discussed. The non-equilibrium state is treated by the Nernst–Planck equation for the ionic transport, and the formalism of equivalent circuits for ionic systems is introduced. Finally, the philosophy of the classical experiments on squid giant axons is illustrated. The course can be easily followed by students having some acquaintance with mathematics and physics, especially with classical thermodynamics and electricity. Author

N68-11657# Lockheed Missiles and Space Co., Sunnyvale, Calif.
THE EFFECT OF LUNAR GRAVITY ON MAN'S PERFORMANCE OF BASIC MAINTENANCE TASKS
Richard J. Shavelson and Joseph L. Seminara 1 Jun. 1967 50 p refs
(LMSC-6-77-96-0; AD-660457)

Nine subjects were trained extensively on three maintenance tasks: bolt torquing, connector mating, and nut threading. They were randomly distributed into one of three clothing conditions (shirt-sleeve, vented suit, and pressurized suit) and trained and tested on all three tasks in three gravity conditions (one gravity, one gravity in the harness, and one-sixth gravity). This study demonstrated that lunar gravity imposed a twenty-five-percent performance decrement over performance in one gravity ($P<.01$). The vented suit imposed a sixty-percent performance decrement ($P<.01$) and the pressurized suit imposed a 150-percent performance decrement ($P<.01$) when compared to performance in the shirt sleeve mode. On the basis of these findings and subjective reports, preliminary human factors design criteria were suggested for lunar gravity performance aids. The need for subsequent research in the areas of mission-specific maintenance tasks and candidate job aids to improve performance in the lunar environment was pointed out. Author (TAB)

N68-11658# Rutgers Univ., New Brunswick, N. J. Douglass Coll.
IMPRESSION FORMATION AS A MEASURE OF THE COMPLEXITY OF CONCEPTUAL STRUCTURE
Siegfried Streufert and Michael J. Driver (Purdue Univ.) Sep. 1967 25 p refs
(Contract N00014-67-A-0115-0002)
(TR-5; AD-659962)

An alternate is presented to the sentence completion test, which was specifically designed to measure one kind of complexity only: perceptual social complexity. This measure is called the Impression Formation Test. In its original form it was first proposed by Streufert and Schroder (1963), but has since undergone considerable alteration in both administration and analysis. Author (TAB)

N68-11758*# Naval School of Aviation Medicine, Pensacola, Fla.
EXPOSURE OF MAN TO LOW INTENSITY MAGNETIC FIELDS IN A COIL SYSTEM
Dietrich E. Beischer, Earl F. Miller, 2, and James C. Knepton, Jr. 3 Oct. 1967 31 p refs Prepared jointly with NASA
(NASA Order R-39)
(NASA-CR-90223; NAMI-1018) CFSTI: HC $3.00/MF $0.65 CSCL 06S

The magnetosphere is an intrinsic component of the earth environment, and travel beyond this sphere will expose man to near absence of a magnetic field. The present study is a continuation of a previous investigation of the physiological and psychological effects of prolonged exposure of man to low intensity magnetic fields. In support of previous findings, a significant gradual decrease of the scotopic flicker fusion threshold was observed from which the subjects recovered after exposure. Problems of life in a magnetic field-free environment are discussed. Author

N68-11781 Deutsche Versuchsanstalt fur Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.
COMPARISON OF THE RESULTS OF SOME CARDIOVASCULAR TESTS AND A HYPOXIC TOLERANCE TEST IN YOUNG UNTRAINED MALES [VERGLEICH VON KREISLAUFFUNKTIONSPRUEFUNGEN UND SAUERSTOFFMANGEL-BELASTUNGSTOLERANZ BEI UNTRAINIERTEN JUNGEN MAENNERN]
K. S. Chalkhaeuser Oct. 1967 49 p refs In GERMAN; ENGLISH summary
(DLR-FB-67-67) CFSTI: $3.00

The physical fitness of 20 nonathletic young males was determined by five tests, measuring the response of the cardiovascular system to dynamic exercise (the Harvard-step-up-test, the Hettinger–Rodahl step-test and the "Leistungspulsindex" of E. A. Müller) and/or to change of position (the Schellong and the Schneider test). In addition, the tolerance to lowered atmospheric pressure in the same group was evaluated. While comparing the results of these tests by statistical methods, a positive correlation could only be found between the two step-tests. On the other hand, the criteria of hypoxic tolerance showed a high but negative correlation to the cardiovascular tests, the "Leistungspulsindex" excepted, which showed no correlation at all. Author

N68-11808*# Minnesota Univ., Minneapolis. School of Public Health.
METHODOLOGY OF MEASURING INTERNAL CONTAMINATION IN SPACECRAFT HARDWARE Final Report
V. W. Greene, Bailus Walker, Jr., and Orin A. Anderson Jun. 1967 60 p refs
(Grant NGR-24-005-063)
(NASA-CR-90533) CFSTI: HC $3.00/MF $0.65 CSCL 06T

An investigation was made to determine (1) the most appropriate methods for recovering inoculated spores from a number of different solids, (2) the reproducibility and precision that can be obtained with these methods, (3) the effects of surface sterilization treatments on occluded contamination, and (4) how long the occluded contaminants survive under different storage conditions. Emphasis was placed on occluded contaminants in polymerizable plastics. A number of side issues were studied, such as the probability of release of embedded spores during impact, and the optimal methods of artificially inoculating and culturing certain solid materials. A summary of significant results and conclusions, and a delineation of anticipated problem areas and recommended actions are included. C.T.C.

N68-11828* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ACCELERATION TERMINOLOGY TABLE OF COMPARATIVE EQUIVALENTS
Gerard J. Pesman Sep. 1965 10 p refs Presented at the Biodyn. Comm. of the Aerospace Med. Panel, Munich, 1–7 Sep. 1965
(NASA-TM-X-60710) CFSTI: $3.00 CSCL 05E

Revisions to two tables of equivalents for acceleration terminology are presented. The tables depict linear and angular motion for human and vehicle coordinate systems. Conventional vehicle axes and axes for space vehicles or VTOL aircraft are included. The interrelationships between vehicle acceleration, the consequent force acting on an occupant, and equivalent terms used to describe directions of these variables are shown in the tables. E.C.

N68-11836* Miami Univ., Coral Gables, Fla. Inst. of Molecular Evolution.
[INVESTIGATIONS IN SPACE-RELATED BIOLOGY, INCLUDING MOLECULAR EVOLUTION AND RELEVANT ASPECTS OF THE EXTRA-TERRESTRIAL ENVIRONMENT] Annual Report, 1 Oct. 1966–30 Sep. 1967
30 Sep. 1967 78 p refs
(Grant NsG-689)
(NASA-CR-90535; AR-3) CFSTI: $3.00 CSCL 06C

The activities and organizational structure of the Institute are reviewed, and summary data are provided on the various research projects being conducted. These include (1) the position of proteinoid microspheres in the continued development of a theory of abiogenesis; (2) amino acid compositions of hydrolyzates of volcanic samples; (3) sequences in thermal polyanhydroamino acids; (4) thermal synthesis of a polymer with MSH activity; (5) catalytic

activities in proteinoids; (6) polymerization in proteinoid microspheres; (7) proteinoid in the photocatalysis of model prebiochemical reactions; (8) catalysis and photocatalysis of decarboxylation of glyoxalate in presence of proteinoids; (9) physiology of reproduction; and (10) organic chemical studies of the carbonaceous constituents of meteorites. M.G.J.

N68-11837* Albert Einstein Coll. of Medicine, New York.
THE EFFECTS OF ISOLATION, SENSORY DEPRIVATION, AND SENSORY REARRANGEMENT ON VISUAL, AUDITORY, AND SOMESTHETIC SENSATION, PERCEPTION, AND SPATIAL ORIENTATION Annual Report, Sep. 1, 1964–Aug. 31, 1965
Sidney Weinstein 31 Aug. 1965 205 p refs
(Grant NsG-489)
(NASA-CR-90498) CFSTI: $3.00 CSCL 06S

Details are given on an experiment dealing with the independent variables of 72 hours of total deprivation of movement, auditory, visual, and somesthetic sensation, and social isolation upon various dependent variables. These dependent variables were a variety of absolute and difference sensory thresholds, and various cognitive, motor, and physiological measures. A series of experiments were conducted to test the assumption that adaptation to a visually rearranged environment results from information on the rearranged environment being fed to the individual. It was further assumed that the source of this information need not be self-induced movement (reafference). The effectiveness of informational feedback in producing adaptation was compared to the degree of adaptation resulting from the effects of self-induced movements. The findings indicate that informational feedback, exclusive of reafference, was either equally effective in producing adaptation to rearrangement or somewhat superior. An extensive bibliography on sensory deprivation and related areas is included. M.G.J.

N68-11855*# System Development Corp., Dayton, Ohio.
IMPLEMENTATION OF COMPUTER SOFTWARE TECHNIQUES TO HUMAN FACTORS TASK DATA HANDLING PROBLEMS Final Report, 21 Jun.–30 Jun. 1967
A. T. Tulley and G. R. Meyer Sep. 1967 98 p refs
(NASA Order R-115; Contract F33615-67-C-1036)
(NASA-CR-90525; AMRL-TR-67-127) CFSTI: HC $3.00/MF $0.65 CSCL 05H

Research leading to the implementation of computer software techniques for handling human factors task data generated in support of aerospace system development programs is discussed. Techniques being explored are based on the assumption that a user-oriented computerized data system will help draw human factors specialists closer to needed data, reduce the problem of data accessibility, and allow more effective use of data in the system engineering process. Proposed data handling techniques are discussed. A computerized data handling system to store, retrieve, and process human factors task data is initially implemented through a pilot study, and design specifications for a computerized experimental system are presented. This system provides the primary means for demonstrating and evaluating the research results against the original research goals. Computer software descriptions are also presented for implementing the pilot study experimental system in a user-oriented environment in terms of information needs of human factors specialists. Author

N68-11871*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Biotechnology Organization.
STUDY AND PRELIMINARY DESIGN OF AN ISOTOPE-HEATED CATALYTIC OXIDIZER SYSTEM, ADDENDUM I
Richard A. Lamparter [1967] 57 p refs
(Contract NAS1-6256)
(NASA-CR-66497) CFSTI: HC $3.00/MF $0.65 CSCL 06K

A study was performed to develop data on system including pre and postsorbent beds for 3, 6 and 9-man crew sizes. This work has been used to support a Basic Subsystem Module (BSM) Study. The basic study assumed the inlet gas stream to be free of compounds which might poison the catalyst. The contaminant load was evaluated to define potential catalyst poisons and compounds which might yield toxic products of combustion and sorbents were evaluated which might be used to remove these compounds. Activated charcoal and lithium hydroxide were found to comprise the optimum presorbent bed and lithium hydroxide, the optimum postsorbent bed. The BSM Study considered the use of isotope and electric heat sources for life support systems. Evaluation of the design shows that its configuration is near optimum for an electrically heated version with the exception of the provisions made for intact reentry. The 9-man pre and postsorbent bed and catalytic oxidizer designs were combined into an integrated system. The favored installation for the system is downstream of the main activated charcoal bed in the BSM life support system, primarily to utilize this charcoal as a pre-sorber. Author

IAA ENTRIES

A68-10031
THE EFFECTS OF WEIGHTLESSNESS.
Michael McCally (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Environmental Medicine Div., Wright-Patterson AFB, Ohio).
Science Journal, vol. 3, Nov. 1967, p. 39-43.

Description of the techniques now being used to simulate prolonged exposure to weightlessness, and of the physiological effects of weightlessness which have been recorded. The results of several experiments during which the subjects were immersed in water for a length of time in various positions are described. The most striking effect of even short periods of immersion was orthostatic hypotension. Assuming that an astronaut will adapt to the physiologically less demanding characteristics of weightlessness, there are two general approaches to the prevention of the undesired consequences of this adaption. The most obvious method is to prevent the adaption by exposing the astronaut to a gravitational force. Secondly, the astronaut may be protected from disuse effects after adaption to weightlessness has occurred. Thus the pooling of blood in the extremities or the abdomen during the reentry may be prevented by the use of an aviator's counter-pressure garment. Some effects of weightlessness experienced by U.S. and Soviet astronauts are described. P. v. T.

A68-10256 *
THE NASA BIOSATELLITE PROGRAM.
B. B. Hall (NASA, Office of Space Science and Applications, Washington, D.C.).
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 6TH, TOKYO, JAPAN, NOVEMBER 29-DECEMBER 4, 1965, PROCEEDINGS. [A68-10177 01-30]
Edited by Daikichiro Mori.
Tokyo, AGNE Publishing, Inc., 1966, p. 791-798.

Description of the various types of mission, experiments, instrumentation, and spacecraft systems of the biosatellite program. The program is a second-generation series of carefully designed experiments, including many highly sophisticated experiments which have required several years of baseline study and equipment development. In addition to providing opportunities for critical testing of major biological hypotheses in the areas of genetics, evolution, and physiology, the results from these biosatellite studies will have broad application to long-term, manned space flight including prolonged orbital missions, and lunar and planetary exploration. Six flights of the biosatellite are planned, with two flights scheduled for each of the three basic payloads. Altogether, 19 experiments have been selected for flight. These selections were made from 187 proposals submitted by scientists. M.M.

A68-10257
A STUDY ON THE SUBGRAVITY FROM THE STANDPOINT OF EMG.
M. Oshima (Tokyo, University, Institute of Medical Electronics, Tokyo, Japan) and O. Okai.
IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 6TH, TOKYO, JAPAN, NOVEMBER 29-DECEMBER 4, 1965, PROCEEDINGS. [A68-10177 01-30]
Edited by Daikichiro Mori.
Tokyo, AGNE Publishing, Inc., 1966, p. 799-802.

Experimental investigation of the effect of subgravity on antigravity muscles, by recording an electromyogram (EMG) from the gastrocnemius muscle of a subject immersed at various depths in water. The results obtained showed that temperature and fatigue have little effect on the EMG in subgravity. It was also found that, with increase in water floatage, the frequency of discharges and the amplitude of muscle-action potentials decrease in the subject immersed in water. The experiments also revealed that it is not necessary to waterproof the electrodes for recording an EMG in water. The EMG recorded in water was compared with an EMG taken on land with a certain resistance inserted between the electrodes. It was found that, to obtain the same amplitude as in water, the inserte resistance should be between 7 and 15 kΩ. M.M.

A68-10426
GENETIC INVESTIGATIONS IN OUTER SPACE.
G. P. Parfenov.
(Kosmicheskie Issledovaniia, vol. 5, Jan.-Feb. 1967, p. 140-155.)
Cosmic Research, vol. 5, Jan.-Feb. 1967, p. 121-123. 150 refs.
Translation.

A68-10434
INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS.
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt (Karolinska Institute, Laboratory of Aviation Medicine, Stockholm, Sweden).
Vienna, Springer-Verlag, 1967. 540 p. In English, Russian, and French.
Members, $27.60; nonmembers, $34.50.

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EFFECTS OF HIGH FREQUENCY ELECTROMAGNETIC FIELDS ON THE UPTAKE OF METHIONINE S 35 BY THE SPLEEN AND LIVER OF MICE [ACTION DES CHAMPS ELECTROMAGNETIQUES HYPERFREQUENCES SUR L'INCORPORATION DE LA METHIONINE 35 S PAR LA RATE ET LE FOIE CHEZ LA SOURIS]. L. Miro, R. Loubière, and A. Pfister (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France), p. 288-297. [See A68-10451 01-04]

A68-10435 *

FUNCTIONAL DISTURBANCES OF VESTIBULAR ORIGIN OF SIGNIFICANCE IN SPACE FLIGHT.

Ashton Graybiel (U.S. Naval School of Aviation Medicine, Pensacola, Fla.).

IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]

Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.

Edited by Hilding Bjurstedt.

Vienna, Springer-Verlag, 1967, p. 8-32; Discussion, Hilding Bjurstedt (Karolinska Institute, Laboratory of Aviation Medicine, Stockholm, Sweden), Campbell, and Pichler, p. 32. 46 refs. Contract No. R-93.

Investigation of the function of the vestibular organ carried out on normal subjects and on deaf persons with bilateral labyrinthine defects. Strong indications are found linking the vestibular functional disturbances observed in the deaf subjects with the loss of their semicircular canals. These persons are found to be free of illusory phenomena originating in the canals but only partially free of illusions originating essentially in the otolith apparatus. They are also insusceptible to sea sickness even in severe storms and in rotating environments. This is related, at least in the latter case, to the absence or depression of the function of the semicircular canal. Some of the implications of these observations for space flight are discussed. V. Z.

A68-10436

CERTAIN PROBLEMS OF ECOPHYSIOLOGY [NEKOTORYE PROBLEMY EKOFIZIOLOGII].

N. M. Sisakian (Akademiia Nauk SSSR, Moscow, USSR).

IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]

Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.

Edited by Hilding Bjurstedt.

Vienna, Springer-Verlag, 1967, p. 33-59; Discussion, p. 60. In Russian and English.

General consideration of the ecophysiological aspects of rocket and space flights in the light of available observations. Current studies of the biological effects of extremal factors of a space environment are surveyed, pointing out cell, subcell, and molecular changes in the human organism investigated by advanced cytological, electron-microscopic and histochemical techniques. Future trends in these studies are outlined. V. Z.

A68-10437

BIOECOLOGICAL AND BIOMEDICAL MONITORING FOR ADVANCED MAN IN SPACE PROJECTS.

Carl-Johan Clemedson (Medical Board of the Armed Forces, Stockholm, Sweden).

IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]

Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.

Edited by Hilding Bjurstedt.

Vienna, Springer-Verlag, 1967, p. 61-79. 111 refs.

Review of crew-health surveillance techniques using data monitoring during space flights. The topics considered include the function of cardiovascular, respiratory, and central nervous systems, wakefulness and alertness, body temperature, and biochemical and immunobiological problems. Aspects of data collecting and processing are discussed briefly. V. Z.

A68-10438

SOME PROBLEMS OF BEHAVIOUR RELATING TO SPACE FLIGHT.

William Kilpatrick Stewart (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).

IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]

Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.

Edited by Hilding Bjurstedt.

Vienna, Springer-Verlag, 1967, p. 80-89; Discussion, O. H. Gauer (Berlin, Freie Universität, Physiologisches Institut, Berlin, West Germany) and R. Grandpierre (Centre d'Enseignement et de Re-

cherches de Médecine Aéronautique, Paris, France), p. 89. 19 refs.

General consideration of the behavioral problems of space flight, such as engineering psychology, the evaluation of the performance of the design, the use of control systems, and the variance of individual operators in training and actual flight. It is suggested that the fundamentals of control of the sensory input be studied by competent neurophysiologists, that the characteristics of simulation of the peripheral receptor be modified, and that the rules for the examination of the sensory function be reviewed on the basis of the latest neurophysiological findings. V. Z.

A68-10439

COMBINED EFFECTS OF SPACE-FLIGHT FACTORS ON CERTAIN FUNCTIONS OF THE ORGANISM [KOMBINIROVANNYE VOZDEISTVIIA FAKTOROV KOSMICHESKOGO POLETA NA NEKOTORYE FUNKTSII ORGANIZMA].

G. M. Frank, N. N. Livshits, M. A. Arcen'eva, Z. I. Apanasenko, L. A. Beliaeva, A. V. Golovkina, V. Ia. Klimovitskii, M. A. Kuznetsova, L. D. Luk'ianova, and E. S. Meizerov (Akademiia Nauk SSSR, Moscow, USSR).

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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 90-140; Discussion, p. 140. 55 refs. In Russian and English.

Review of the authors' recent studies of the combined effects of the environmental factors of space flight, such as acceleration, vibration, and ionizing radiation, on the functions and oxygen metabolism of the central nervous system, on the division of cells in the hemogenic tissues, and on blood circulation in the brains of experimental animals. It is shown how diverse the final physiological effects may become when dynamic factors and radiation are applied in various combinations. V. Z.

A68-10440 *

INTERACTION OF RADIATION AND OTHER ENVIRONMENTAL STRESSES IN BIOLOGICAL SYSTEMS.

C. A. Tobias, N. M. Amer, J. K. Ashikawa, J. T. Lyman, L. W. McDonald, J. V. Slater, C. A. Sondhaus, and P. W. Todd (California, University, Lawrence Radiation Laboratory, Donner Laboratory of Medical Physics and Biophysics, Berkeley, Calif.).

IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 141-157; Discussion, p. 157, 158. 24 refs.
NASA-AEC-supported research.

Review of the authors' studies of cellular and molecular biological effects of ionizing radiation in microorganisms and mammals, designed to facilitate a better understanding of radiobiological aspects of present and past life on the planets and to provide a basis for an assessment of radiation hazards of manned space flight. Two clearly discernible types of cellular radiobiological effects are noted - an oxygen-induced effect involving single ion pairs, delta rays, and small cell clusters and resulting in partially reversible cellular injuries, and a damaging effect almost independent of ambient-oxygen concentration and probably due to the heavily ionizing core of particle tracks. The effects of protons, alpha particles, and heavier ions on mammalian cells are also discussed. V. Z.

A68-10441

TOLERANCE TO THE COMBINED EFFECTS OF HYPOTHERMIA, ANOXIA, AND IONIZING RADIATION.

R. K. Andjus, Olivera Matic, and Nadezda Savkovic (Belgrade, University, Institute of Physiology; Boris Kidrič Institut za Nuklearne Nauke, Belgrade, Yugoslavia).

IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 159-169; Discussion, Novak, p. 169. 23 refs.

An experimental study on rats was undertaken in order to evaluate to what extent severe anoxia, made tolerable by virtue of hypothermia, may prove of protective value against lethal effects of ionizing radiation. A protective factor approaching 3 proved to be obtainable by the combination of deep but spontaneously reversible hypothermia and a severe but easily tolerable anoxia, provoked by tracheal occlusion. Terminal respiratory movements were recorded and changes of brain ATP, ADP, AMP, creatine phosphate, and lactate levels were followed during the course of anoxia, so that degrees of protection, afforded by different phases of the postocclusion period, could be correlated with biochemical and physiological parameters. (Author)

A68-10442

CRITERIA FOR RADIATION SAFETY IN PROLONGED SPACE FLIGHTS [KRITERII RADIATSIONNOI BEZOPASNOSTI DLITEL'NYKH KOSMICHESKIKH POLETOV].

Iu. G. Grigor'ev, E. E. Kovalev, A. V. Lebedinskii, Iu. G. Nefedov, V. G. Vysotskii, N. I. Ryzhov, B. A. Markelov, L. N. Smirennyi, V. E. Dudkin, and N. N. Derbeneva (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR).

IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 170-196; Discussion, p. 196, 197. 29 refs. In Russian and English.

Analysis of the radiation hazards of a space environment in terms of safety criteria, based on a review of recent published data. It is maintained that radiation hazards of interplanetary flights will be largely due to primary cosmic rays and to the proton emission from solar flares and that the corpuscular radiation of the Van Allen belts will also contribute to radiation hazards during long flights in near-earth space. Special attention is given to the choice of safety criteria for manned space flights in terms of permissible radiation doses. A lack of essential information for establishing these criteria is indicated. V. Z.

A68-10443 *

CARDIOPULMONARY EFFECTS OF ACCELERATION IN RELATION TO SPACE FLIGHT.

Earl H. Wood, W. J. Rutishauser, N. Banchero, A. Clark Nolan, A. G. Tsakiris, and D. E. Donald (Mayo Clinic and Mayo Graduate School of Medicine, Rochester, Minn.).

IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 198-210; Discussion, Heinz Bartels (Tübingen, Universität, Physiologisches Institut, Tübingen, West Germany), R. Grandpierre (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France), and Pace, p. 210, 211. 12 refs.
American Heart Association Grant No. CI 10; NIH Grant No. HE-03532; Grant No. NsG-327.

Discussion of the cardiopulmonary effects of acceleration in relation to space flight, based on recent published studies. Various pressure imbalances developing in the potential intrapleural space are indicated, notably those developing at the interface between air- and blood-containing lung sections, due to the difference in specific gravities. These and other disorders are shown to be capable of causing physical disruption of the lung structures, a collapse of involved lung portions, severe disturbances in ventilation-perfusion ratios, and, finally, large pulmonary arterial-venous shunts responsible for arterial hypoxemia observed under these circumstances. It is concluded that next to equipment or instrumental malfunction, the cardiopulmonary disorders caused by acceleration are the most probable cause of mission impediment or failure. V. Z.

A68-10444
FLUID METABOLISM AND CIRCULATION DURING AND AFTER SIMULATED WEIGHTLESSNESS.
O. H. Gauer, P. Eckert, D. Kaiser, and H. J. Linkenbach (Berlin, Freie Universität, Physiologisches Institut, Berlin, West Germany).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 212-220; Discussion, p. 220, 221. 15 refs.
Grant No. AF EOAR 65-63.

Description of fluid-metabolism and circulation studies under simulated weightlessness produced by immersing an individual in water. The diuretic condition associated with water immersion is discussed, indicating that it can be interrupted or prevented by vasopressin infusion or injection. It is also indicated, that the diuresis of immersion may be not solely due to a reduction of vasopressin content but also due to the occurrence of a diuretic factor in the blood plasma. Measurements with Evans blue revealed an average 14% reduction of plasma volume after an 8-hr immersion. V. Z.

A68-10445
VASCULAR REACTIVITY TO NEUROHORMONES IN SUBGRAVITY SIMULATED BY IMMERSION METHOD.
J. Walawski and Z. Kaleta (Akademia Medyczna, Katedra Patofizjologii, Warsaw, Poland).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 222-228.

Dogs in chloralose anaesthesia were submersed in NaCl solution at a temperature of 35°C. Respiration was made possible by a tracheotomy tube connected with a respiratory valve. The vascular reactions, registered as systemic arterial blood pressure changes, were observed after adrenaline, noradrenaline, acetylcholine, histamine, and serotonin administration. The results indicate that a 24-hr period of subgravity simulated by the immersion method does not induce significant changes in vascular reactions to neurohormones. (Author)

A68-10446
TYPICAL PROBLEM OF AEROSPACE BIOLOGY - EFFECTS OF MECHANICAL VIBRATIONS AT THE MITOSIS LEVEL [UN PROBLEME ORIGINAL EN BIOLOGIE AEROSPATIALE - L'ACTION DES VIBRATIONS MECANIQUES AU NIVEAU CELLULAIRE].
P. Grognot, R. Loubière, and A. Pfister (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 229-233. 5 refs. In French.

Study of the mitosis of Erlich's neoplastic ascites induced in mice by grafting, carried out to verify the deteriorating effects of vibrations on the mitotic figures of the hematopoietic marrow of mice observed during space flight. It is found that for vibrations of 70 Hz, with an amplitude of 0.4 mm, applied for 7 to 30 min, the rate of anaphase deterioration is three times that of control animals. The general growth curve of the tumor was, however, little affected during the experiment. It is believed, therefore, that the growth of the graft-induced neoplastic ascites is due not solely to the multiplication of the injected cells. It is shown that the peritoneal serous fluid also participates actively in the process of cellular proliferation. V. Z.

A68-10447
THE TOXIC EFFECTS OF BREATHING OXYGEN.
John Ernsting (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 234-256; Discussion, R. Grandpierre, R. Loubière (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France), Heinz Bartels (Tübingen, Universität, Physiologisches Institut, Tübingen, West Germany), and C. A. Tobias (California, University, Lawrence Radiation Laboratory, Donner Laboratory of Medical Physics and Biophysics, Berkeley, Calif.), p. 256, 257. 86 refs.

Assessment of the toxic effects of breathing at increased partial pressures of oxygen, in the light of extensive literature data. It is shown that oxygen produces toxic disturbances when breathed for long periods at partial pressures in excess of 0.5 atm. Some of the disturbances induced by breathing 100% oxygen are shown to be related to the absence of inert gas. It is recommended that the partial pressure of oxygen in the gaseous environment of a space cabin not exceed 0.5 atm and that at least 40% of the atmosphere consist of an inert insoluble gas such as nitrogen. V. Z.

A68-10448
EFFECT OF PROLONGED (100 DAYS) EXPOSURE TO A PURE OXYGEN ATMOSPHERE AT A TOTAL PRESSURE OF 198 MM Hg ON ORGANISMS [VLIIANIE NA ORGANIZM DLITEL'NOGO PREBYVANIIA (100 SUTOK) V ATMOSFERE CHISTOGO KISLORODA PRI OBSHCHEM DAVLENII 198 MM RT. ST.].
N. A. Agadzhanian, Iu. P. Bizin, G. P. Doronin, A. G. Kuznetsov, and A. R. Mansurov (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]

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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 258-273. 12 refs. In Russian and English.

Discussion of experiments in which 148 white rats were exposed over a period of 100 days to a pure oxygen atmosphere at pressures at which the toxic effects of the gas do not manifest themselves. It is found that the structure of the positive conditioned reflexes was not impaired and that the rate of the motor reactions in response to stimuli remained practically constant. In the absence of hypoxia, the animals exhibited an increase in hemoglobin and the number of erythrocytes; immature forms of erythrocytes in the blood (indicative of a stimulation of the blood production system) were also noted. Localized atelectasis was also observed in the animals, together with a certain increase in the dimensions of the heart. The weight of the animals decreased by 25% during the first 40 to 50 days, only to recover during the following days and to surpass the weight of the control animals at the end of the experiment. The chloride content decreased in the blood and increased in the urine. The water content in the skin and muscles decreased but recovered toward the end of the experiment. The latter effects are attributed to a rarefaction of the atmosphere. No decomposition symptoms were observed. The overall results indicate that a pure oxygen atmosphere is well suited for use in space vehicles. V.P.

A68-10449
THE FORMATION OF CARBON MONOXIDE IN THE LIVING ORGANISM - A FACTOR TO BE CONSIDERED IN SPACE FLIGHT.
Torgny Sjöstrand (Karolinska Hospital, Dept. of Clinical Physiology, Stockholm, Sweden).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 274-278; Discussion, C. A. Tobias (California, University, Lawrence Radiation Laboratory, Donner Laboratory of Medical Physics and Biophysics, Berkeley, Calif.), Biget, and Roth, p. 278. 10 refs.

Theoretical and experimental investigation of ways of eliminating carbon monoxide in the cabin of a space vehicle. Experiments have been reported which indicate that carbon monoxide can be oxidized in some animals. If this does not happen in man, the CO concentration of the air in the cabin of a space vehicle may reach toxic levels after some time, if carbon monoxide is not eliminated by technical means. M.F.

A68-10450
EXAMPLES OF DEFENSE AGAINST LOW OXYGEN AND HIGH CARBON-DIOXIDE TENSIONS IN THE ANIMAL KINGDOM.
Heinz Bartels (Tübingen, Universität, Physiologisches Institut, Tübingen, West Germany).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 279-287. 18 refs.

Comparison between problems of respiration and gas exchange as experienced by animals within and beneath the earth's atmosphere and those encountered during manned space flight. The mammalian fetus is discussed in reference to the various mechanisms it employs to overcome the difficulties posed by the in utero environment lacking in oxygen and with increased carbon dioxide tensions. The comparative physiology of the mode of adaptation by means of erythrocytosis, increased oxygen affinity, and the Bohr effect in various animals is described for both in utero and high-altitude environments. It is pointed out that altitude acclimatization is less comparable to the situation of man in space than the in utero environment. M.F.

A68-10451
EFFECTS OF HIGH FREQUENCY ELECTROMAGNETIC FIELDS ON THE UPTAKE OF METHIONINE S 35 BY THE SPLEEN AND LIVER OF MICE [ACTION DES CHAMPS ELECTROMAGNETIQUES HYPERFREQUENCES SUR L'INCORPORATION DE LA METHIONINE 35S PAR LA RATE ET LE FOIE CHEZ LA SOURIS].
L. Miro, R. Loubière, and A. Pfister (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 288-297. In French.
Research supported by the Direction des Recherches et Moyens d'Essais and the Centre d'Etudes Nucléaires de Saclay.

Study of the cellular and metabolic consequences of the exposure of mice to high-frequency electromagnetic fields. The experiments were carried out on two groups of mice. The first group was exposed during 150 hr to a high-frequency electromagnetic field, while the second was used as a control group. After irradiation, an intraperitoneal injection of Methionine S 35 was given to each animal. After autopsy, it was found that the presence of amino acids was much greater in the animals exposed to the high-frequency magnetic fields than in the control group. A statistical analysis of the results shows that the difference is extremely significant and confirms this fact. This observation, which proves that there is an increase of protein synthesis in the liver and spleen, indicates that the high-frequency magnetic fields have an exciting effect on the reticulohistocytic system. M.F.

A68-10452
SOME RESULTS OF MEDICAL INVESTIGATIONS PERFORMED DURING THE FLIGHT OF THE VOSKHOD SPACECRAFT [NEKOTORYE REZUL'TATY MEDITSINSKIKH ISSLEDOVANII, PROVEDENNYKH VO VREMIA POLETA KORABLIA "VOSKHOD"].
Iu. M. Volynkin and P. V. Vasil'ev (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 298-321; Discussion, p. 321, 322. 8 refs. In Russian and English.

Discussion of the generalized results of medical investigations performed by means of biotelemetric systems and portable scientific instruments under space-flight conditions. The data obtained are used to analyze the physiological reactions of cosmonauts during the various flight phases, and hypotheses explaining these reactions are proposed. It is noted that the investigations did not reveal any pathological reactions. The data obtained are used to evaluate the limits of future space missions. V.P.

A68-10453
ELECTROCORTICOGRAPHICAL ACTIVITY IN DIFFERENT PHASES OF FLIGHT IN AIRCRAFT AND ROCKETS [L'ACTIVITE ELECTROCORTICOGRAPHIQUE LORS DES DIFFERENTES PHASES DU VOL EN AVION OU EN FUSEE].
P. Buser, G. Chatelier, J. Ginet, and R. Grandpierre (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 323-334; Discussion, P. V. Vasil'ev (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR), Proctor, Flickinger, and Mayo, p. 334. In French.

Study of the effects of weightlessness on the central nervous system through experiments on rats and cats in aircraft and rockets. In each case, the animal's electrocortical activity was recorded during a flight comprising a period of weightlessness preceded by an acceleration phase. The appearance on the cortex of slow hypersynchronous waves occurring in bursts of from 10 to 20 sec, resembling the drowsy stage preceding sleep, was observed several times. These slow waves may be ascribed to a substantial drop in the animal's degree of alertness. Two explanations are suggested: (1) the sudden decrease of sensory and proprioceptive stimuli may lead to a substantial decrease in the activity of the ascending reticular activation system; and (2) the disappearance of the habitual sensito-sensorial standards and the appearance of a new stimulus may release a supramaximal inhibition mechanism of Pavlovian type. M.F.

A68-10454
ACTIVITY OF THE SENSORY SYSTEMS IN APPLICATION TO SPACE-PHYSIOLOGY PROBLEMS [NEKOTORYE VOPROSY DEIATEL'NOSTI SENSORNYKH SISTEM PRIMENITEL'NO K ZADACHAM KOSMICHESKOI FIZIOLOGII].
V. D. Glezer, V. A. Kisliakov, V. A. Kozhevnikov, V. N. Chernigovskii, and L. A. Chistovich (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 335-360. In Russian and English.

Discussion of the principal results obtained in studies of the activity of the human sensory systems. Vestibular-analyzer data are examined, together with data concerning the general principles of the recognition of images and sounds of human speech. Hypotheses associated with the solution of the man-machine problem in engineering psychology are discussed, and possible practical consequences and conclusions directly associated with space-physiology problems are examined. V.P.

A68-10455
RELIABILITY OF MAN IN OPERATING SPACECRAFT CONTROL SYSTEMS [PROBLEMY NADEZHNOSTI CHELOVEKA V SISTEMAKH UPRAVLENIIA KOSMICHESKIM KORABLEM].
P. K. Isakov, V. A. Popov, and M. M. Sil'vestrov (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 361-372; Discussion, p. 372, 373. In Russian and English.

Discussion of a simulator model for studying the efficiency of man as a link in a spacecraft control system under various flight conditions. The schematic diagram of the simulator is examined, and its suitability for solving various space-flight problems is analyzed. The latter include: the analysis of the dynamics of a control process involving a human operator (in which the equations of the control system and the plant are solved on a computer); the solution of the problem of synthesizing the control system by reducing it to the proper selection of the structure of the variable portion of the system, as well as the selection of the system characteristics, the parameters, and the form of the information model from the technological conditions and operator characteristics; the experimental investigation of the control system (part of the system elements are taken in their natural state, while the other part is reproduced by a computer from given equations); and the experimental investigation of the system behavior under laboratory conditions and its efficiency in cases where the operator is subjected to specific simulated space-flight factors. V.P.

A68-10456
PHYSIOLOGICAL, BEHAVIORAL, AND SUBJECTIVE REACTIONS TO STRESS.
Marianne Frankenhaeuser (Stockholm, University, Psychological Laboratories, Stockholm, Sweden).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
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Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 374-387; Discussion, p. 387, 388. 22 refs.
Research supported by the Swedish Council for Social Science Research, the Swedish Medical Research Council, and the Harald and Greta Jeansson's Foundation.

Outline of some experimental approaches to the study of psychological stresses. The topics under discussion include experimental results concerning the effects of electrical stimulation of various intensities and durations, adjustment to gravitational loads, and perceptual disorders. These results show a close correlation between subjective reactions and both adrenaline excretion and tissue conductance. Physiological reactions of individuals performing mental work are investigated by measuring catecholamine excretion rates. Laboratory experiments are conducted in order to determine the interference of various stimuli, and the effect of expectation on the objective and subjective reactions of individuals. V.Z.

A68-10457
ON THE DANGERS OF OVER-AROUSAL.
D. E. Broadbent (Medical Research Council, Applied Psychology Research Unit, Cambridge, England).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.

Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 389-398. 33 refs.

Study showing that overstimulation may produce inefficiency. The mechanism by which overarousal produces impairment is uncertain, although a theory of facilitation of error responses is popular and partially supported. A new experiment on detrimental effects of noise shows some results consistent with this theory, but some are hard to explain. Evidence is presented for the ineffectiveness of increased stimulation beyond a certain level, and interactions between the various "arousing" conditions are discussed. M.F.

A68-10458
HABITABILITY - GENERAL PRINCIPLES AND APPLICATIONS TO SPACE VEHICLES.
Joseph F. Kubis (Fordham University, New York, N.Y.).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 399-427. 59 refs.

Discussion of the physical, physiological, psychological, and social components of the habitability of space vehicles. It is pointed out that as space flights lengthen and multiple crews become the rule, the psychological and social components of habitability will demand very serious consideration. In this regard psychological adequacy, comfort, and group integrity become critical focal issues. No earthbound studies of habitability have substantial predictive value for long-term space flights unless they are verified in orbiting space laboratories which can control the basic interactions of weightlessness with all other relevant physiological and behavioral parameters. M.F.

A68-10459
PHYSIOLOGICAL-HYGIENIC EVALUATION OF THE LIFE-SUPPORT SYSTEMS OF THE VOSTOK AND VOSKHOD SPACECRAFT [FIZIOLOGO-GIGIENICHESKAIA OTSENKA SISTEM ZHIZNENNOGO OBESPECHENIIA KOSMICHESKIKH KORABLEI "VOSTOK" I "VOSKHOD"].
G. I. Voronin, A. M. Genin, and A. G. Fomin (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 428-445; Discussion, p. 445, 446. In Russian and English.

Experimental investigation of the physiological and hygienic requirements of space life-support systems. Tests are described in which the functional state of man was studied for various parameters of the artificial atmosphere and various nutrition and water-supply conditions. The results obtained were taken as a basis for the determination of the physiological and hygienic requirements placed on the air-conditioning system, and rationing of food and water. The schematic diagrams of the life-support systems are examined, together with operation under various flight conditions. V.P.

A68-10460
NUMERICAL INDICES OF CARDIOVASCULAR STATUS.
P. Howard, G. H. Byford, J. Stoddart, and M. J. Allwood (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 447-452.

Discussion of the possibility of using digital techniques to express cardiovascular status as a single number. Three initial steps are required before the data are combined: the selection of suitable parameters to be measured, the transformation of the measurements into numerical form, and the assignment of a weighting factor to each variable. The application of these methods to the measurement of the heart rate, blood pressure, cardiac output and peripheral vascular resistance is discussed. The advantages and limitations of the analytical method are reviewed. M.F.

A68-10461 *
COMPUTER UTILIZATION OF TIME-LINE MEDICAL DATA FROM MAN IN SPACE FLIGHT.
Jefferson F. Lindsey (NASA, Office of Manned Space Flight, Washington, D.C.).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 453-476; Discussion, Pollack, Flickinger, and Jones, p. 476, 477. 16 refs.

Study of the time-line approach developed to accomplish the aims of the NASA medical data program. This program is designed to contribute to (1) the safety of the astronauts while in flight, (2) the development of scientific products, and (3) the standardization of in-flight and ground-based medical data so that they are in a standard and mutually interchangeable form for computer inputs. The work involved in preparing time-line medical data is reviewed, and examples of types of analyses performed are discussed, together with their limitations. These include graphical analyses, rate-of-change and rate-of-rate-of-change analyses, some computer programs for statistical analyses, and statistical-model limitations. M.F.

A68-10462 *
THE DEVELOPMENT OF SPACE SUIT SYSTEMS.
Richard S. Johnston (NASA, Manned Spacecraft Center, Crew Systems Div., Houston, Tex.).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 478-493; Discussion, p. 493.

Outline of the basic requirements for spacesuits for the Gemini and Apollo manned space-flight programs. The philosophy utilized in the suit development programs and the operational use of these spacesuit systems are discussed. The Gemini spacesuit used in intravehicular and extravehicular missions is described. A portable life-support system design required for extravehicular excursions is presented, and the proposed operational use is outlined. The Apollo Extravehicular Mobility Unit is discussed. This unit is made up of a spacesuit, portable life-support system, thermal pro-

tection system, electrical power system, communications and telemetry systems, and micrometeoroid protection system. Some of the developmental problems and design approaches are described. The planned operational use of the Extravehicular Mobility Unit is also outlined. (Author)

A68-10463 *
THE UTILITY OF AUTOMATED SYSTEMS IN THE SEARCH FOR EXTRATERRESTRIAL LIFE.
Orr E. Reynolds (NASA, Washington, D.C.) and Harold P. Klein (NASA, Ames Research Center, Moffett Field, Calif.).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 494-505; Discussion, Heinz Bartels (Tübingen, Universität, Psychologisches Institut, Tübingen, West Germany), C. A. Tobias (California, University, Lawrence Radiation Laboratory, Donner Laboratory of Medical Physics and Biophysics, Berkeley, Calif.), Frank, and Lampert, p. 505.
19 refs.

Discussion of the prospects of developing automatic life-detection systems for future studies of the planets, considering Mars to be their immediate subject. Higher automation-level computerized Martian probe techniques and equipment are suggested in view of the many unknowns of the Martian environment and the great communication distance. These include the programing of individual experiments so that later experiments could benefit from earlier ones, and an automatic scanning of experimental results for selecting the best information for transmission to earth. The possibility of the existence of extraterrestrial life chemically different from that on earth is pointed out, and sampling programs prepared for that are considered. V.Z.

A68-10464 *
THE ROLE OF INFRARED SPECTROSCOPY IN THE BIOLOGICAL EXPLORATION OF MARS.
D. G. Rea (California, University, Space Sciences Laboratory, Berkeley, Calif.).
IN: INTERNATIONAL SYMPOSIUM ON BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE, 2ND, PARIS, FRANCE, JUNE 14-18, 1965, PROCEEDINGS. [A68-10434 01-04]
Symposium supported by the International Astronautical Federation, the International Academy of Astronautics, the United Nations Educational, Scientific and Cultural Organization, the International Atomic Energy Agency, the World Health Organization, the World Meteorological Organization, and the International Telecommunication Union.
Edited by Hilding Bjurstedt.
Vienna, Springer-Verlag, 1967, p. 506-531; Discussion, C. A. Tobias (California, University, Lawrence Radiation Laboratory, Donner Laboratory of Medical Physics and Biophysics, Berkeley, Calif.), Pace, and Frank, p. 531. 35 refs.
Grant No. NsG-101-61; Contract No. NASr-220.

Discussion of applications of IR spectrography in biological studies of Mars, pointing out the results achieved and anticipated. Among the topics covered are the mechanism of IR radiation absorption and emission for a group of organic radicals and compounds suspected to be present on Mars, remote IR observation techniques for the Martian atmosphere and surface, and IR measurements on a landed laboratory. The great potential of IR spectrography in Martian biological studies is emphasized. V.Z.

A68-10970 *
ELECTRICAL IMPEDANCE PLETHYSMOGRAPHY - A CRITICAL ANALYSIS.
Robert V. Hill, Jerold C. Jansen, and James L. Fling (Oregon, University, Medical School, Dept. of Ophthalmology, John E. Weeks Memorial Laboratory, Portland, Ore.).
Journal of Applied Physiology, vol. 22, Jan. 1967, p. 161-168.
26 refs.
Grant No. NGR-38-003-004.

Discussion of the need for a reevaluation of the concepts in electrical impedance plethysmography. In the course of calibrating an electrical impedance plethysmograph for blood flow monitoring, it was found that the device was not only uncalibratable, but that the theory of this type of plethysmography was also invalid. Laboratory experiments with bovine tissues and with simulated blood volume changes in a synthetic system showed that electrical impedance plethysmographs of all types, including the so-called impedance spirometer and the so-called rheoencephalograph, produce totally uncalibratable strain-gage-type signals. M.F.

A68-11069
ADAPTATION OF THE OPERATOR TO CHANGES IN GAIN FACTOR OF A SERIES-CONNECTED AMPLIFIER.
I. E. Tsibulevskii.
(Avtomatika i Telemekhanika, Mar. 1967, p. 117-125.)
Automation and Remote Control, Mar. 1967, p. 461-467. Translation.

Experimental investigation of the transient process as a random function of time in a feedback system consisting of a human operator and an amplifier. The experiments were conducted with a group of operators for various values of the gain factor and initial signal. P.v.T.

A68-11088 #
REGULATION AND CONTROL IN BIOLOGICAL SYSTEMS.
A. S. Iberall and S. Z. Cardon (General Technical Services, Inc., Yeadon, Pa.).
IN: SYSTEMS ENGINEERING FOR CONTROL SYSTEM DESIGN; PROCEEDINGS OF THE TOKYO SYMPOSIUM, TOKYO, JAPAN, AUGUST 25-28, 1965. [A68-11072 01-10]
Symposium sponsored by the Technical Committee on Theory and the Technical Committee on Applications of the International Federation for Automatic Control, and the Science Council of Japan.
Edited by Kankuro Kaneshige and Keisuke Izawa.
Tokyo, Science Council of Japan; International Federation for Automatic Control, 1966, p. 463-471; Discussion, H. M. Paynter (Massachusetts Institute of Technology, Cambridge, Mass.) and J. H. Milsum (McGill University, Montreal, Canada), p. 472, 473.

Description of a number of the autonomous oscillators (cyclic systems) continuously operating in complex biological systems. It has become increasingly apparent that the many oscillators in the human biological system (controlling breathing, hearthbeat, eating, etc.) are not incidental characteristics of the system, but represent the working components of the system. In accordance with this view, it is proposed that homeostasis, Cannon's organizing biological concept of a complex regulation characteristic of the system, is obtained as a result of shifting the stability of these intrinsic nonlinear oscillators. The oscillators are believed to be modulated or shifted in operating points by electrical and chemical signals, thus illustrating dynamic control. In fact, it is likely that the same type of instability mediation is the foundation for all automatic control theory. P.v.T.

A68-11101 *
RESPONSE OF SOIL BACTERIA TO HIGH TEMPERATURES AND DIURNAL FREEZING AND THAWING.
R. S. Young, P. H. Deal, and O. Whitfield (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
Nature, vol. 216, Oct. 28, 1967, p. 355, 356.

Note on a microscopic study of growth of soil bacteria exposed to a temperature of 135°C for 16 to 144 hr and to temperatures of 145 and 200°C for 24 hr, followed by freezing. The study was designed to determine the ability of potential spacecraft contaminants to survive and proliferate in freeze-thaw conditions of an extraterrestrial environment. The results appear to indicate that freeze-thaw conditions preceded by heating substantially impede bacterial growth. V.Z.

A68-11256
PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII].
Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966. 283 p. In Russian.

CONTENTS:

A68-11257 #
SPECIAL FUNCTIONAL DIAGNOSIS AND ITS PHYSIOLOGICAL FOUNDATIONS [SPETSIAL'NAIA FUNKTSIONAL'NAIA DIAGNOSTIKA I EE FIZIOLOGICHESKIE OSNOVY].
G. L. Komendantov.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII].
Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia, Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 7-15. 29 refs. In Russian.

Introductory discussion of the principal features and methods of special functional diagnosis in aviation medicine, the aim of which is to detect deviations of various functions from the normal state which are too slight to be detected by methods of general functional diagnostics. It is particularly suited to determine the functional changes in pilots resulting from overfatigue and the initial phases of chronic fatigue. The methods used to detect these functional deviations and their influence on pilot efficiency are examined. V. P.

A68-11258 #
NEW DATA ON CHANGES IN THE EXTERNAL RESPIRATION OF HUMAN SUBJECTS IN GOOD AND POOR HEALTH UNDER HYPOXIA CONDITIONS. I [NEKOTORYE NOVYE DANNYE OB IZMENENIIAKH VNESHNEGO DYKHANIIA U ZDOROVOGO I BOL'NOGO CHELOVEKA V USLOVIIAKH GIPOKSII. I].
V. N. Alifanov.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII].
Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 16-21. 12 refs. In Russian.

Investigation aimed at clarifying existing discrepancies concerning the behavior of lung volumes under hypoxia conditions. Experiments performed with healthy subjects and subjects suffering from disturbances of the nervous system, tuberculosis, and similar ailments did not reveal any pronounced changes in the lung volumes under conditions of moderate hypoxia in either case. Neither the vital lung capacity nor the reserve respiratory volume changed appreciably, although the latter did show a tendency to decrease. Under severe hypoxia conditions, the reserve volume of sick subjects exhibits a substantial decrease, while the tendency toward a decrease in vital lung capacity and an increase in the functional residual capacity increases. V. P.

A68-11259 #
NEW DATA ON CHANGES IN THE EXTERNAL RESPIRATION OF HUMAN SUBJECTS IN GOOD AND POOR HEALTH UNDER HYPOXIA CONDITIONS. II [NEKOTORYE NOVYE DANNYE OB IZMENENIIAKH VNESHNEGO DYKHANIIA U ZDOROVOGO I BOL'NOGO CHELOVEKA V USLOVIIAKH GIPOKSII. II].
V. N. Alifanov.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII].
Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 22-29. 22 refs. In Russian.

Investigation of the changes in the pulmonary ventilation of healthy and sick subjects under hypoxia conditions. Tests of the respiratory rate performed with 660 healthy subjects in an altitude chamber at a "height" of 5000 m showed an increase in respiratory rate in 33.9% of the cases, a decrease in 42.7% of the cases, and no changes in this rate in 23.4% of the cases. The analogous percentage for subjects with ailments of the cardiovascular system

was 29.0%, 46.3%, and 24.7%, and for subjects with residual ailments of the respiratory organs - 28.6%, 52.4%, and 19.0%. Pulmonary-ventilation tests showed an increase of 35 to 40% for healthy subjects, an increase of 80 to 85% for subjects with residual ailments of the respiratory organs and of the cardiovascular system, and an increase of 40 to 45% for subjects with ailments of general type. V.P.

A68-11260 #
CHANGES IN CARDIAC OUTPUT OF HEALTHY PERSONS AND PERSONS WITH AILMENTS OF THE CARDIOVASCULAR SYSTEM SUBJECTED TO HYPOXIAL HYPOXIA [IZMENENIIA SERDECHNOGO VYBROSA PRI GIPOKSICHESKOI GIPOKSII U ZDOROVYKH I U LITS S ZABOLEVANIIAMI SERDECHNOSOSUDISTOI SISTEMY].
V. M. Muraenko.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 30-34. 12 refs. In Russian.

Investigation of the changes in the cardiac output of 126 civil-aviation crewmen under conditions of low oxygen partial pressures in the inhaled air, with the object of determining the functional state of the cardiovascular system. Of the subjects tested, 43 were in good health, 49 had phase A hypertonic ailments, and 34 first-phase ailments of coronary atherosclerosis. The results revealed a substantial difference in the adaptive reactions of the subjects in good and poor health under conditions of special functional loading. The changes observed are characteristic of the state of the regulatory mechanisms of the cardiovascular system. V.P.

A68-11261 #
PHASE ANALYSIS OF OXYHEMOGRAMS TAKEN FROM PERSONS IN GOOD AND POOR HEALTH IN FUNCTIONAL RESPIRATION-RETENTION TESTS UNDER HYPOXIA CONDITIONS [FAZOVYI ANALIZ OKSIGEMOGRAMM ZDOROVYKH I BOL'NYKH LIUDEI PRI FUNKTSIONAL'NOI PROBE S ZADERZHKOI DYKHANIIA PRI GIPOKSII].
V. N. Alifanov.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 35-50. 13 refs. In Russian.

Analysis of all the phases of oxyhemograms obtained in tests with respiration retention after expiration to determine the circulation rate in the lung-ear area. It is shown that the oxyhemograms consist of six to seven phases, rather than four phases, as is commonly assumed. An analysis of each of the phases shows that under hypoxia conditions with respiration retentions, each phase exhibits certain characteristic changes, which are particularly pronounced for subjects with functional ailments of the cardiovascular system. These changes are seen to be of importance in the functional diagnosis of latent circulation defects. V.P.

A68-11262 #
CERTAIN HEMODYNAMIC INDICES OF FLIGHT PERSONNEL IN GOOD AND POOR HEALTH UNDER HYPOXIA CONDITIONS [NEKOTORYE GEMODINAMICHESKIE POKAZATELI U ZDOROVYKH I BOL'NYKH LITS LETNOGO SOSTAVA PRI GIPOKSII].
V. M. Muraenko.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 51-65. 39 refs. In Russian.

Investigation of the hemodynamic cardiac activity of healthy subjects and subjects with first-phase hypertonic and coronary atherosclerosis ailments under conditions of reduced oxygen partial pressure. It is found that the adaptive reactions differ widely for each of the three groups of subjects tested. The characteristic features of these reactions are examined for each case. V.P.

A68-11263 #
AN EXPERIMENT IN RECORDING ELECTROCARDIOGRAMS OF PILOTS IN ACTUAL AND SIMULATED FLIGHT [OPYT REGISTRATSII ELEKTROKARDIOGRAMM U PILOTOV V USLOVIIAKH POLETA I NA LETNYKH TRENAZHERAKH].
V. P. Erokhin.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 66-71. 18 refs. In Russian.

Discussion of the technical details and results of an experiment in which electrocardiograms of pilots were recorded by conventional and telemetric techniques under actual flight conditions and in simulated flight. It is shown that the use of a telecardiograph is particularly effective when applied to Master's test, but that preference should be given to conventional techniques if there is a choice. V.P.

A68-11264 #
POSSIBLE MEANS OF DETECTING LATENT VESTIBULAR DEFECTS IN THE PRESENCE OF HYPOXIAL HYPOXIA [O VOZMOZHNOSTI VYIAVLENIIA SKRYTYKH VESTIBULIARNYKH NARUSHENII PRI GIPOKSICHESKOI GIPOKSII].
S. I. Stepanova.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 72-80. 10 refs. In Russian.

Experimental investigation aimed at determining whether latent defects of the functional equilibrium and spatial-orientation system do not become acute in the presence of hypoxial hypoxia, leading to a decoordination of the pilot's functions. Tests with rabbits with induced unilateral defects of the aural labyrinth showed a decompensation of the normally compensated defects in the functional equilibrium system. The decompensation manifested itself in the form of changes in the relation between the tonus of the right and left sternocleidomastoid muscle and in the appearance of visible signs of unilateral labyrinth defects at "heights" between 6000 and 9000 m. The principal role in the mechanism of the decompensation is attributed to functional defects of the cerebral cortex resulting from hypoxial hypoxia. V.P.

A68-11265 #
ANALYSIS OF THE MECHANISM OF THE INTEROCEPTIVE REFLEXES DURING HIGH-ALTITUDE METEORISM [K ANALIZU MEKHANIZMA INTEROTSEPTIVNYKH REFLEKSOV PRI VYSOTNOM METEORIZME].
M. D. Chirkin.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 81-95. 57 refs. In Russian.

Description of tests in which novocaine was used as a functional actuator of the interoceptors (mechanoreceptors) of the gastrointestinal tract. It is found that, although the major portion of reflector changes in the functioning of the respiratory system can be attributed to reflexes induced by the mechanoreceptors, some of the reflector changes depend on the position of the diaphragm. An elevated state of the diaphragm can impair respiration, as well as blood and lymph circulation. V. P.

A68-11266 #
DEPENDENCE OF THE TEMPERATURE OF THE ORGANS AND TISSUES OF AN ORGANISM ON THE AMBIENT TEMPERATURE AND ON CHANGES IN THE OXYGEN PARTIAL PRESSURE [ZAVISIMOST' TEMPERATURY ORGANOV I TKANEI ORGANIZMA OT VNESHNEI TEMPERATURY I IZMENENII PARTSIAL'NOGO DAVLENIIA KISLORODA].
I. I. Antonov.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 96-102. 6 refs. In Russian.

Experimental investigation showing that, in the case of hypoxemia and normal ambient temperature, there is a difference in the temperature of the various organs of animals (rabbits). Particularly variable is the cerebral temperature, the changes being directly related to the influence on the organs of low and high oxygen partial pressure, which impairs the normal temperature relations between the various cerebral layers, and also leads to changes in the normal state of the animals. V. P.

A68-11267 #
NEW DATA ON POSTURAL EXTENSOR REFLEXES [NOVYE DANNYE O VYPRIAMITEL'NYKH USTANOVOCHNYKH REFLEKSAKH].
G. L. Komendantov.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 103-110. 10 refs. In Russian.

Consideration of the extensor reflexes in humans and animals, taking part in the mechanism of restoration of a lost postural equilibrium. A labyrinth otolith extensor reflex, unknown heretofore, is described. New data are given on the progress of the extension process in the limbs during a free fall. V. Z.

A68-11268 #
CHARACTERISTIC OF THE EXTENSOR REACTION IN RABBITS [K KHARAKTERISTIKE VYPRIAMITEL'NOI REAKTSII KROLIKA].
S. I. Stepanova.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy Volume 95), 1966, p. 111-119. 6 refs. In Russian.

Demonstration that the characteristic feature of the extensor reaction of a rabbit in a lateral position is the presence of a "reactive component" of extension, furthering the correct posture of the head and of the upper part of the body. It is also shown, with a probability of 99.9%, that the latent time of the cervical extensor reflex on the hind legs of rabbits is between 12.3 and 45.6 sigmas. The otolith apparatus is primarily responsible for the extension function and acts as an inhibitor on a less important preprioceptive reflex of the hind legs. V. Z.

A68-11269 #
EFFECTS OF THE LABYRINTHS ON THE CERVICAL MUSCLE TONUS [K VOPROSU O VLIIANII LABIRINTOV NA TONUS SHEINYKH MYSHTS].
S. I. Stepanova.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 120-129. 16 refs. In Russian.

Demonstration that the electromyographic tonus of the sternocleidomastoid muscles of intact rabbits is equally strong on both sides and that it weakens considerably on the operated side and remains essentially unaffected on the intact side after unilateral labyrinthectomy. This observation is consistent with the findings of Magnus (1924). V. Z.

A68-11270 #
CLASSIFICATION OF POSTURAL REFLEXES [KLASSIFIKATSIIA USTANOVOCHNYKH REFLEKSOV].
G. L. Komendantov.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 130-137. 28 refs. In Russian.

Consideration of various types of postural reflexes and existing classifications of them, notably a classification proposed in 1924 by Magnus, and a classification of labyrinth postural reflexes developed by de Kleyn and Versteegh. An augmented classification is proposed, covering various groups of postural, compensatory, and extensor reflexes both conditioned and unconditioned. V. Z.

A68-11271 #
EARLY DIAGNOSIS OF LATENT CORONARY DEFICIENCY IN CIVIL-AVIATION FLIGHT PERSONNEL [K VOPROSU O RANNEI DIAGNOSTIKE SKRYTOI KORONARNOI NEDOSTATOCHNOSTI U LITS LETNOGO SOSTAVA GRAZHDANSKOI AVIATSII].
L. M. Lemesheva.
IN: PROBLEMS OF AVIATION MEDICINE AND OF NORMAL AND PATHOLOGICAL PHYSIOLOGY [VOPROSY AVIATSIONNOI MEDITSINY, NORMAL'NOI I PATOLOGICHESKOI FIZIOLOGII]. Edited by G. L. Komendantov, S. M. Leites, E. F. Polezhaev, and M. D. Chirkin.
Moscow, Izdatel'stvo Tsentral'nyi Institut Usovershenstvovaniia Vrachei (Tsentral'nyi Institut Usovershenstvovaniia Vrachei, Trudy. Volume 95), 1966, p. 138-141. 6 refs. In Russian.

Note on a technique for early diagnosis of potential coronary deficiency in crew members of aircraft, using the ratio between the Q - X and Q - T segments of EKG, as suggested by Lepeshkin in 1958, as a criterion of a pathological shift in the S - T interval of EKG. Diagnostic tests, at atmospheric pressure and at a pressure of 405 mm Hg, on a group of 16 healthy crew members and a group of 27 crew members with compensated atherosclerotic cardiosclerosis are described. V. Z.

A68-11370
HEAT TRANSFER IN BIOTECHNOLOGY.
Alice M. Stoll (U.S. Naval Material Command, Naval Air Development Center, Aerospace Medical Research Dept., Johnsville, Pa.).
IN: ADVANCES IN HEAT TRANSFER. VOLUME 4.
Edited by J. P. Hartnett and T. F. Irvine, Jr.
New York, Academic Press, Inc., 1967, p. 65-141. 120 refs.

Discussion of aspects of heat transfer in biotechnology. General information is provided in the field of heat transfer between the human organism and its various environments. Particular informa-

tion is provided concerning the medium supporting the thermal interface between the organism and its surroundings - namely, the skin. The units of measurement are sometimes English and at other times metric. No conversions to a single system are provided. M.M.

A68-11505
PSYCHOPHYSIOLOGICAL FLIGHT OCCURRENCES AT HIGH VELOCITY AND LOW ALTITUDE [A PROPOS DES INCIDENCES PSYCHO-PHYSIOLOGIQUES DU VOL A GRANDE VITESSE ET A BASSE ALTITUDE].
P. -R. Pon.
Forces Aériennes Françaises, vol. 22, Nov. 1967, p. 623-666. In French.

Results of research and experiments on the physiological and psychosensory flight occurrences at high velocity and low altitude. A study is made of the effects of the vibrations and aerodynamic, atmospheric, and maneuver accelerations on the physiology and performance of the pilot. Psychosensory occurrences are discussed with emphasis on visual occurrences. Methods of improving the safety and efficiency of the aircraft system are considered. M. F.

A68-11551
CHLORELLA ON BOARD KOSMOS 110.
E. N. Vaulina, I. D. Anikeeva, and G. P. Parfenov.
(Kosmicheskie Issledovaniia, vol. 5, Mar.-Apr. 1967, p. 285-292.)
Cosmic Research, vol. 5, Mar.-Apr. 1967, p. 246-252. 14 refs. Translation.

A68-11552
RECESSIVE LETHALS IN THE X CHROMOSOME OF DROSOPHILA AND GENETIC PROTECTION DURING THE FLIGHT OF THE SPACESHIP VOSKHOD.
Ia. L. Glembotskii, G. P. Parfenov, Iu. L. Lapkin, and I. V. Baranovskaia.
(Kosmicheskie Issledovaniia, vol. 5, Mar.-Apr. 1967, p. 293-297.)
Cosmic Research, vol. 5, Mar.-Apr. 1967, p. 253-256. 15 refs. Translation.

A68-11559
FURTHER INVESTIGATION OF THE EFFECT OF SPACE-FLIGHT CONDITIONS ON THE CHROMOSOMES OF RADICLES IN THE SEEDS OF SOME HIGHER PLANTS.
N. L. Delone and V. V. Antipov.
(Kosmicheskie Issledovaniia, vol. 5, Mar.-Apr. 1967, p. 312.)
Cosmic Research, vol. 5, Mar.-Apr. 1967, p. 274. Translation.

A68-11665 *
EVOLUTION OF HEURISTICS BY HUMAN OPERATORS IN CONTROL SYSTEMS.
R. E. Thomas and J. T. Tou (Battelle Memorial Institute, Information Science Research Center, Columbus, Ohio).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INTERNATIONAL CONVENTION, NEW YORK, N. Y., MARCH 20-23, 1967; 1967 IEEE INTERNATIONAL CONVENTION RECORD, VOLUME 15, PART IX - BIO-MEDICAL ENGINEERING; HUMAN FACTORS; SYSTEMS SCIENCE AND CYBERNETICS. [A68-11662 02-08]
New York, Institute of Electrical and Electronics Engineers, Inc., 1967, p. 179-192.
NASA-supported research.

The paper presents a mathematical model for decision-making in control systems. The model is constructed to perform four modes of control - (1) probing mode, (2) gradient mode, (3) heuristic mode, and (4) terminal mode. The operation of the model switches from one mode to another by following certain decision logic, which simulates the function of a human operator in a control system and the evolution of heuristics for control. The simulation results compare favorably with the data obtained from experiments with subjects. (Author)

A68-11710
EFFECT OF CO_2 INHALATION ON BRAIN RHEOGRAPHY - ATTEMPT TO MEASURE A BRAIN BLOOD-FLOW INDEX THAT CAN BE USED IN AVIATION [INFLUENCE DE L'INHALATION DE CO2 SUR LA RHEOGRAPHIE CEREBRALE - ESSAIS DE MESURE D'UN INDEX DE DEBIT SANGUIN CEREBRAL UTILISABLE EN MILIEU AERONAUTIQUE].
Jean Demange and Gérard Demon (Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, Essonne, France).
Revue de Médecine Aéronautique et Spatiale, vol. 6, 2nd Quarter, 1967, p. 5-9. 7 refs. In French.

Rheographic investigation of the possibility of measuring blood flow in the brain using either a four-electrode or two-electrode method. The experimental results showed that, under certain conditions of electric frequency and location of the electrodes, it is possible to follow changes in brain blood flow by the two-electrode method of measuring impedance changes. M.M.

A68-11711
USE OF RADIOLOGY IN THE ANALYSIS OF THE VARIOUS FACTORS THAT RESULT IN POOR POSITION OF THE PILOT DURING EJECTION [UTILISATION DE LA RADIOLOGIE DANS L'ANALYSE DES DIFFERENTS FACTEURS ENTRAINANT UNE MAUVAISE POSITION DU PILOTE A L'EJECTION].
Roland-Paul Delahaye, Henri Seris, Henri Mangin, and Robert Auffret (Hôpital Militaire d'Instruction Dominique Larrey, Service d'Electro-Radiologie, Versailles; Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, Essonne, France).
Revue de Médecine Aéronautique et Spatiale, vol. 6, 2nd Quarter, 1967, p. 11, 12. In French.

Radiographic investigation of several factors bearing on the poor positioning of a pilot during ejection - positioning that can lead to various kinds of fracture. The results showed that all factors that result in the thrusting forward of the head and - even worse - the shoulders are unfavorable. The improper folding of the parachute or an excessively large or ill-fitting helmet may cause bending of the spine. The most important factor is the position of the pilot. The height-adjustment of the seat is most vital and should not be altered at the time of ejection. Some spine malformations, such as kyphosis in particular, are contraindications against the practice of ejection. M.M.

A68-11712
COMPARISON OF TRACINGS OF BRAIN RHEOGRAPHY AND CAROTIDOGRAMS IN THE NORMAL AND PATHOLOGICAL SUBJECT [COMPARAISON DES TRACES DE RHEOGRAPHIE CEREBRALE ET DES CAROTIDOGRAMMES CHEZ LE SUJET NORMAL ET EN PATHOLOGIE].
R. Carre, J. Demange, and J. Pernod.
Revue de Médecine Aéronautique et Spatiale, vol. 6, 2nd Quarter, 1967, p. 13-15. In French.

Comparison of recordings of different parameters of brain-blood circulation obtained by the two different techniques of brain X-ray and carotidograms. The results obtained showed that the strict analogy of the recordings of the two technically different methods makes it possible to: (1) eliminate the discussion on the possibility of a morphological artifact; (2) confirm that these two methods do not show inertia or distortions caused by the captor, the amplifiers, or the recorders; (3) bring up arguments confirming that blood pressure and volume pulse changes are closely connected; and (4) believe that rheography is an essentially sphygmographic recording. M.M.

A68-11713
CONTRIBUTION TO THE STUDY OF THE GENETIC EFFECTS OF MECHANICAL VIBRATIONS ON DROSOPHILA MELANOGASTER [CONTRIBUTION A L'ETUDE DES EFFETS GENETIQUES DES VIBRATIONS MECANIQUES SUR DROSOPHILA MELANOGASTER].

A. M. Pfister, J. P. Bregliano, G. Deltour, and R. Kaiser. Revue de Médecine Aéronautique et Spatiale, vol. 6, 2nd Quarter, 1967, p. 21-23. In French.

Description of the results of four investigations of the effects of mechanical vibrations on the total number of descendants and number of recombined descendants in drosophila melanogaster. It is pointed out that, in a control group, Abeleva et al. (1961) had found 0.11% of recombined individuals out of 3662 flies. This figure is too high to represent simply spontaneous crossing over, therefore it is not to be ruled out that a factor other than vibrations may have caused the results obtained by them. Although they may play a definite role in the determination of mitotic anomalies, mechanical vibrations of 70 Hz and 0.4 mm of amplitude do not seem to have any genetic consequences. M.M.

A68-11964 *

AMINO-ACIDS AND AMINO-SUGARS IN CALCIFIED TISSUES OF PORTUNID CRABS.

Egon T. Degens, Francis G. Carey, and Derek W. Spencer (Woods Hole Oceanographic Institution, Woods Hole, Mass.).

Nature, vol. 216, Nov. 11, 1967, p. 601-603. 16 refs.

NASA-NSF-AEC-supported research.

Determination of the amino-acid and amino-sugar composition of representative regions in the exoskeleton of the Portunid crab, and relation of these data to the calcification phenomena. Data on calcium, magnesium, and strontium obtained by atomic absorption spectrophotometry and on phosphate by colorimetry were used as a measure of the degree of calcification of the individual organic matrix. The interrelationships within and between the amino-acids, the amino-sugars, and calcium were explored, using factor analysis. Based on the relationship between the present data on mineralized tissues in Portunid crabs and previous results largely inferred from electron micrographs, a tentative model of the calcification in this biological system is presented. R. B. S.

A68-12079 *

IDENTITY OF THE C_{50}-CAROTENOID DEHYDROGENANS-P439 AND SARCINAXANTHIN.

S. Liaaen-Jensen (Norwegian Institute of Technology, Organic Chemistry Laboratories, Trondheim, Norway), O. B. Weeks (New Mexico State University, Research Center and Dept. of Biology, Las Cruces, N. Mex.), R. H. C. Strang, and D. Thirkell (St. Andrews University, Dept. of Biochemistry, St. Andrews, Scotland).

Nature, vol. 214, Apr. 22, 1967, p. 379, 380. 17 refs.

Grant No. NGR-32-003-027.

Proof that the C_{50}-carotenoid dehydrogenans-P439 and sarcinaxanthin are identical. The conclusion was based upon melting-point and mass spectrometry testing. It is pointed out that no procedure other than mass spectrometry is known which will distinguish unequivocally between the well-known C_{40}-carotenoids and the C_{50} structure of sarcinaxanthin. R.B.S.

A68-12093 *

MIDDLE-EAR CHARACTERISTICS OF ANESTHETIZED CATS.

W. T. Peake (Massachusetts Institute of Technology, Research Laboratory of Electronics, Cambridge; Massachusetts Eye and Ear Infirmary, Eaton-Peabody Laboratory of Auditory Physiology, Boston, Mass.) and J. J. Guinan, Jr.

Acoustical Society of America, Journal, vol. 41, May 1967, p. 1237-1261. 50 refs.

Research supported by the Joint Services Electronics Program, NSF, and NIH; Grants No. NsG-496; No. NsG-22-009-019.

Ossicular motion was measured visually with stroboscopic illumination. Tonal stimulation ranged from 30 to 10,000 Hz. Up to 130 db SPL (sound-pressure level), the motion of the stapes is predominantly piston-like, and its displacement amplitude is linearly related to sound pressure. At frequencies under 3000 Hz, the ossicles move as one rigid body; at higher frequencies, the stapes and incus displacements lag behind the malleus displacement, which suggests that the incudo-malleolar joint flexes. From measurements of stapes displacement at known sound pressures, a transfer characteristic is calculated for the middle ear with the tympanic cavities open. The effects of closing the tympanic cavities on the transfer characteristic were determined from measurements in which the electric response recorded from the round window was used as an indicator of middle-ear output. By combining these data, a transfer characteristic is obtained for the middle ear with the tympanic cavities intact. An attempt is made to compare middle-ear characteristics of cat and man. (Author)

A68-12134 *

INDOCYANINE GREEN CLEARANCE AS A TEST FOR HEPATIC FUNCTION - EVALUATION BY DICHROMATIC EAR DENSITOMETRY.

Carroll M. Leevy, Frank Smith, Jacques Longueville, Gustav Paumgartner, and Maceo M. Howard (Jersey City Medical Center, New Jersey College of Medicine and Dentistry, Dept. of Medicine, Div. of Hepatic Metabolism and Nutrition, Jersey City; U.S. Veterans Administration Hospital, East Orange, N.J.).

American Medical Association, Journal, vol. 200, Apr. 17, 1967, p. 236-240. 14 refs.

Research supported by the New Jersey State Department of Health; NIH Grants No. TI-AM-5236-06; No. HE-04530-06; Grants No. NsG-594; No. NsG-31-02-002.

Results of studies designed to establish the reliability of dichromatic ear densitometry for evaluating hepatic clearance of indocyanine green (ICG) and to determine whether the use of a larger dose would increase the sensitivity of ICG. Sequential clearance studies in the same patient with increasing doses of ICG demonstrate that a sufficiently high dose of this dye permits differentiation of patients with mild liver injury from those with normal liver. F.R.L.

A68-12135 #

VALIDITY OF THE HUMAN 17-HYDROXYCORTICOSTEROID/CREATININE RATIO.

Henry B. Hale (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.) and Ira L. Shannon (Veterans Administration Hospital, Oral Physiology Research Laboratory, Houston, Tex.).

Aerospace Medicine, vol. 38, Nov. 1967, p. 1095-1098. 36 refs.

Short- and long-term time trends for urinary creatinine excretion rate, 17-hydroxycorticosteroid (17-OHCS) excretion rate, and the 17-OHCS/creatinine ratio were investigated, utilizing data obtained from 11 healthy men during forenoon and afternoon periods on five consecutive days in each of four consecutive weeks. Creatinine excretion rate did not show significant forenoon-afternoon variation, but there was forenoon-afternoon variation ($P < .01$) for both 17-OHCS excretion rate and the 17-OHCS/creatinine ratio, each declining as time proceeded. Using creatinine as the base for 17-OHCS did not cause distortion; instead, there was a statistical gain, as the variance was then lessened. Significant week-to-week variation was detected only in the afternoon data, and it was limited to creatinine excretion rate ($P < .001$) and 17-OHCS excretion rate ($P < .01$), both declining progressively over the four-week test period. Since the 17-OHCS/creatinine ratio did not show week-to-week variation, it was concluded that creatinine acted as a correction factor, eliminating the long-term variation in 17-OHCS. (Author)

A68-12136 *

INVERSION ILLUSION IN PARABOLIC FLIGHT - ITS PROBABLE DEPENDENCE ON OTOLITH FUNCTION.

Ashton Graybiel and Robert S. Kellogg (U.S. Naval Aviation Medical Center, Naval Aerospace Medical Institute, Pensacola, Fla.; USAF, Systems Command, Aerospace Medical Div., Wright-Patterson AFB, Ohio).

Aerospace Medicine, vol. 38, Nov. 1967, p. 1099-1103. 12 refs.

NASA-sponsored research.

Observations were made on normal subjects and deaf persons with bilateral labyrinthine defects (L-D subjects) under three different conditions in parabolic flight: (1) free floating, (2) restrained in a Fiberglas mold, and (3) "standing" on the overhead during a

modified parabola generating about -0.05-g unit. There were inter-individual differences in the reactions among the normal but not among the L-D subjects. Some of the normal but none of the L-D subjects experienced a reversal of their personal orientation with regard to up-down under all three conditions. The possibility was considered that this "reversal" had its genesis in the vestibular organs, probably the otolith apparatus. The findings are in accord with Russian reports describing feelings of inversion among cosmonauts in orbital flight. Attention is called to the necessity of distinguishing between information furnished by touch pressure, kinesthesis, and stereagnosis under ordinary conditions and agravic touch pressure, agravic kinesthesis, and agravic stereagnosis. (Author)

A68-12137
HABITUATION TRANSFERENCE IN CORIOLIS ACCELERATION.
Patrick J. Dowd and Robert L. Cramer (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, ENT Branch, Vestibular Section, Brooks AFB, Tex.).
Aerospace Medicine, vol. 38, Nov. 1967, p. 1103-1107. 8 refs.

Coriolis accelerations in flight adversely affect a pilot's efficiency and physical fitness by two vestibular reactions. One is illusions; the other is vestibulo-autonomic reactions. In this study, both these vestibular reactions were modified by the subject's being repeatedly exposed to rotary stimulation while being passively tilted in different planes of rotation or while actively tilting his head into a rotary plane. Three conditions were used during rotation: chair tilts in the lateral plane, active head movements in the lateral plane, and active head movements in the sagittal plane. Results indicate habituation (a decrement in nystagmus, in subjective sensations, and in somatic responses) after repeated exposure to each condition. Transference of this habituation to one head movement or position change appears to have some effect on the duration of nystagmus and sensations to exposure to another head movement or position change. The dynamic characteristics of nystagmic responses and the autonomic reactions, however, do not show any significant transference of habituation. Thus, transfer of habituation cannot be obtained for different conditions. Each condition must be practiced separately despite their similarity in sensations and nystagmic responses. (Author)

A68-12138
ILLUSIONS BEFORE THE ONSET OF UNCONSCIOUSNESS IN SIMULATED FLIGHT.
Joseph Dvorak, V. Cerny, and B. Filsakova (Institute of Aviation Medicine, Prague, Czechoslovakia).
Aerospace Medicine, vol. 38, Nov. 1967, p. 1108, 1109.

In nine untrained subjects illusions before the onset of unconsciousness in nitrogen hypoxia during horizontal level flight in a ground simulator were analyzed. Before a complete loss of consciousness in 60%, illusions of falling down and/or to one side were recorded, resulting in an uncorrect maneuver, leading to a nose-up and tilt position of the cabin. In natural flight without doubt the only result could be an abrupt pullup of the aircraft followed by a stall. The illusions were never observed in fixed cabin. (Author)

A68-12139 *
APPLICATION OF GAS CHROMATOGRAPHY IN MANNED SPACE FLIGHT.
John D. Lem, Jr. (NASA, Manned Spacecraft Center, Crew Systems Div., Support Development Branch, Houston, Tex.).
Aerospace Medicine, vol. 38, Nov. 1967, p. 1110-1117.

A trace contaminant detection system using gas chromatographic techniques has been developed to provide real-time analysis of the space cabin atmosphere and suit gas during space flight. The carrier gas in the detection system is helium, housed in a 5.9-in.-diam titanium sphere. Electronics are provided for amplification of the detector signals, zero compensation, oven temperature control, amplifier attenuation, and automatic programing. The analyzer subassembly consists of three separate columns and associated cross-section ionization detectors. The system has undergone extensive testing, including both laboratory tests and chamber simulations, and will be of great assistance in answering the trace contaminant question. (Author)

A68-12140
HEART RATE OF PILOTS FLYING AIRCRAFT ON SCHEDULED AIRLINE ROUTES.
H. P. Ruffell Smith.
Aerospace Medicine, vol. 38, Nov. 1967, p. 1117-1119. 5 refs.

The heart rate of seven experienced pilots was recorded at five-second intervals during takeoff and landing and at five-minute intervals during preflight checks, taxiing and the remainder of the flight. The rate of all of the pilots was raised during every takeoff and landing. It was also increased to a varying extent according to the difficulties and hazards of the remainder of the flying task. The results support the view that the number of hours flown is not the only parameter needed to measure the work done by civil air transport pilots. (Author)

A68-12141
ULTRA-LOW FREQUENCY DISPLACEMENT BALLISTOCARDIOGRAM - NORMAL STANDARDS AND CLINICAL OBSERVATIONS.
J. Eldrid Smith (United Air Lines, Inc., Medical Dept., Washington, D.C.).
Aerospace Medicine, vol. 38, Nov. 1967, p. 1120-1129. 23 refs.

Study of 500 normal persons, using an ultra-low frequency ballistocardiograph of extremely low natural frequency using an air bearing suspension. These subjects were divided into 10-year age groups with 106 subjects between the ages 20-30, 197 subjects between the ages 30-40, and 197 subjects between the ages 40-50. It was obvious that normal standards in the 40-50 group should not be attempted until at least a three year follow-up. During this period, eight cases have developed cardiovascular disease and five have died. Emphasis has been placed on the displacement measurement since the deviation from normal in certain instances seemed to be more obvious, although velocity and acceleration have also been studied. It seems probable that the measurement of the displacement IJ + JM amplitudes is an extremely important clinical measurement. A displacement IJ + JM under 20 mm or 100 μ combined with a short HI or poorly developed I wave with a deep K on the acceleration curves, seems to indicate developing cardiovascular disease in asymptomatic people. The effect of mild hypertension on these curves is further illustrated. (Author)

A68-12142 *
PHYSIOLOGICAL LIMITATIONS OF ANIMAL RESTRAINT.
E. L. Besch (Kansas State University, Institute for Environmental Research, Manhattan, Kan.), A. H. Smith, R. R. Burton, and S. J. Sluka (California, University, Dept. of Animal Physiology, Davis, Calif.).
Aerospace Medicine, vol. 38, Nov. 1967, p. 1130-1134. 23 refs.
Grant No. NGR-05-004-010.

In the development of procedures which will sustain a mature domestic fowl for prolonged periods of time - i.e., 30 days - several types of restraint were investigated. The effect of restraint appears to be directly proportional to the duration of exposure and, uniformly, these animals show symptoms not unlike those incident to starvation syndrome in addition to a generalized dehydration. These results do not appear to be due to inanition per se since animals deprived completely of feed and water survive for significantly longer periods of time and have a weight loss rate greater than the restrained animals. The effects of restraint on white blood cells is similar to that following injection of ACTH and cortisone-acetate indicating a state of acute stress. There was a relative and absolute lymphopenia, a relative and absolute rise in heterophils with no change in the absolute numbers of erythrocytes. (Author)

A68-12143 *
EFFECT OF GARMENTS WHICH PROVIDE WORK LOADS IN PREVENTING THE CARDIOVASCULAR DECONDITIONING OF BEDREST.
Fred B. Vogt (Texas Woman's University, Denton; Texas, University, Graduate School of Biomedical Sciences, Houston, Tex.), Pauline Beery Mack (Texas Woman's University, Nelda Childers Stark Laboratory for Human Nutrition Research, Denton, Tex.), and Philip C. Johnson (Baylor University, College of Medicine and Methodist Hospital, Houston, Tex.).

Aerospace Medicine, vol. 38, Nov. 1967, p. 1134-1137. 8 refs. NASA-sponsored research; NIH Grant No. FR 00254.

Five healthy adult male subjects participated in two successive bedrest periods of three weeks' duration to evaluate the potential protective effect of exercise garments in preventing the cardiovascular deconditioning associated with prolonged bedrest. During the first period of bedrest, the subjects underwent a period of inactive bedrest during which they remained flat in bed. During the second period of bedrest, the subjects wore a specially fitted suit to provide an exercise load to the musculoskeletal system. The results of the studies indicated no statistically significant difference in the cardiovascular response after the two bedrest conditions. (Author)

A68-12144

DELETERIOUS EFFECT ON ASTRONAUT CAPABILITY OF VESTIBULO-OCULAR DISTURBANCE DURING SPACECRAFT ROLL ACCELERATION.

Vernon L. Grose (Tustin Institute of Technology, Santa Barbara, Calif.).

Aerospace Medicine, vol. 38, Nov. 1967, p. 1138-1144. 18 refs.

Discussion of the physiological limitations of the human and his susceptibility to error when subjected to extended and accelerated spacecraft rolling. The context for discussion is provided by the Gemini 8 spaceflight emergency of uncontrolled and accelerated rolling which caused the premature abort of the mission. Data from this flight imply that astronaut performance was impaired due to vestibulo-ocular disturbance. Five deleterious effects are attributed to spacecraft roll acceleration - disorientation, dizziness, impaired vision, nausea, and panic. Recommendations for astronaut selection and conditioning as well as spacecraft design are proposed to minimize these effects of accelerated rolling. (Author)

A68-12145

PERSONALITY AND ACHIEVEMENT OF AIR TRAFFIC CONTROLLERS.

David K. Trites (Rochester Methodist Hospital, Rochester, Minn.), Adolph Kurek (Federal Aviation Administration Academy, Oklahoma City, Okla.), and Bart B. Cobb (Federal Aviation Administration, Aeromedical Service, Civil Aeromedical Research Institute, Psychology Section, Oklahoma City, Okla.).

Aerospace Medicine, vol. 38, Nov. 1967, p. 1145-1150. 13 refs.

Personality characteristics of 338 Enroute Air Traffic Control Specialists (ATCS) contributing to greater or less than predicted achievement in training at the FAA Academy and relationships between this over- and underachievement in training and subsequent job performance were investigated. From a regression weighted combination of aptitude test scores and biographical characteristics predicted course-grade averages were computed and subtracted from actual grade averages to obtain an estimate of over- or underachievement. These difference scores were correlated with the 18 scales of the California Psychological Inventory and with measures of job performance. Overachievers were found to be more intellectually efficient, more interested in achievement, responsible, dominant, tolerant, self-controlled, socially mature and aware of others, interested in giving a good impression, and had a greater personal sense of well-being than the underachievers. Relationships between the difference scores and six aspects of job performance were all significantly positive. It was concluded that (1) over- or underachievement during training reflected differences in personality structure among trainees, and (2) over- or underachievement was a relatively stable characteristic of individuals manifested subsequently in their job performance. (Author)

A68-12146 #

REDUCED PRESSURE POTENTIATION OF THE SIDE EFFECTS OF THE ANTIMALARIAL, DAPSONE.

Jarrell D. Bairrington, Thomas S. Sulkowski, James H. Merritt, and Albert T. Bernardini (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Biosciences Branch, Physiological Chemistry Section, Brooks AFB, Tex.).

Aerospace Medicine, vol. 38, Nov. 1967, p. 1151-1154. 28 refs.

Examination of ways of protecting aircrews operating in Southeast Asia from drug-refractory strains of falciparum malaria. Since side effects such as anemia and methemoglobinemia are seen as a result of Dapsone therapy, this investigation was undertaken to determine if the stress of altitude would potentiate these harmful effects. Four groups of male Sprague-Dawley rats (250 to 350 gm) received one week of pretreatment (intraperitoneal injection) with diaminodiphenyl-sulfone (Dapsone, USP) at dose levels of 0.5, 1.0, 2.5, and 5.0 mg/kg, respectively. Each of the four groups were divided into two subgroups. Treatment with Dapsone continued throughout the second week with daily injections to subgroup I at ground level and subgroup II at a simulated altitude of 18,000 ft and ground level equivalent PO_2 (42% O_2) for 4 hr daily. Blood was drawn from each subgroup and their corresponding untreated controls by cardiac puncture on the first, third, and fifth day of the second week of treatment. The results of this study show that hypobaric conditions, with ground equivalent oxygen, increase the relative toxicity of Dapsone in rats when compared with animals treated at ground level. This increase in toxicity is evidenced by marked decreases in reticulocyte count ($P < .01$), hemoglobin values ($P < .01$), and erythrocyte count ($P < .01$) at the 0.5-mg/kg, 1.0-mg/kg, and 5.0-mg/kg dose levels after 4, 12, and 20 hr respectively, of simulated flight at 18,000 ft on 42% oxygen. A "Pressure Factor," separate from the hypoxic factor, heretofore disregarded or unrecognized on the pharmacological action of drugs in hypobaric or hyperbaric drug studies, is proposed as the precipitating cause for the observations seen. The implications of this concept on aerospace medicine are discussed. (Author)

A68-12147

DIFFERENTIAL DIAGNOSIS OF DISORIENTATION IN FLYING.

P. J. O'Connor (Royal Air Force, Central Medical Establishment, London, England).

Aerospace Medicine, vol. 38, Nov. 1967, p. 1155-1160. 7 refs.

Details of the first 30 cases referred to a panel of consultants investigating aviators who complain of unusual or persistent symptoms of disorientation in the air. The importance of psychological factors in perpetuating disorientation symptoms is emphasized. Treatment was by explanation, supportive psychotherapy, and familiarization flying. Two-thirds of the 30 aviators returned to flying. (Author)

A68-12148

PRIMARY MYOCARDIAL DISEASE - REPORT OF A CASE.

J. Eldrid Smith (United Air Lines, Inc., Medical Dept., Elk Grove Township, Ill.) and George J. Kidera (United Air Lines, Inc., Medical Dept., Washington, D.C.).

Aerospace Medicine, vol. 38, Nov. 1967, p. 1161-1164. 9 refs.

A case of primary myocardial disease is presented which showed marked hypertrophy of the left ventricle with near obliteration of the left ventricular cavity. This type of obstructive cardiomyopathy has a strong tendency to occur in families and has a high degree of likelihood of sudden death. The asymptomatic character of this disease in some people, and the danger of sudden death at an early age, makes this disease a dangerous malady for airline pilots. The use of routine electrocardiography before hiring would probably eliminate these cases from a career in aviation. (Author)

A68-12149

FUNCTIONAL CHEST PAIN.

Don E. Flinn (California, University, Center for Health Sciences, Neuropsychiatric Institute, Space Biology Laboratory, Los Angeles, Calif.).

Aerospace Medicine, vol. 38, Nov. 1967, p. 1167-1170. 8 refs.

In aviation medicine, accurate diagnosis of the cause of chest pain is particularly important. Although the requirement of flying safety demands the early detection of cardiac disease, it is also important to recognize and properly manage the cases in which chest pain is caused by emotional factors. Functional chest pain may be a conversion ("hysterical") symptom, in which emotional distress is perceived as a somatic symptom, or it may be the result of smooth muscle spasm, mediated through autonomic innervations, affecting organs of the upper abdomen and chest. Important factors in the differential diagnosis of chest pain include its characteristics, the manner in which the patient describes and reacts to the pain, and

the circumstances in which it occurs. The possibility of adding an iatrogenic element in cases of functional chest pain can be minimized by careful history and examination. (Author)

A68-12150 #
AEROMEDICAL EVALUATION OF TOPICAL 2 PER CENT LEVO-EPINEPHRINE ON NORMAL SUBJECTS.
Charles R. O'Briant (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio), Thomas J. Tredici (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.), and James F. Culver (USAF, Systems Command, Aerospace Medical Div., Brooks AFB, Tex.).
Aerospace Medicine, vol. 38, Nov. 1967, p. 1171-1174. 19 refs.

As the USAF flying population ages, glaucoma becomes a problem of increasing importance. Prior to 1963 all patients with a diagnosis of glaucoma were permanently grounded. This was due, in part, to the adverse effects on vision of the parasympathomimetic drugs used in the treatment of glaucoma. Levo-epinephrine drugs lower the intraocular pressure and produce less interference with visual functions. This would make them ideal drugs for the initial treatment of glaucoma in flyers. The purpose of the study is to learn the effects of levo-epinephrine drugs in normal, volunteer subjects, with careful attention to all possible aeromedical parameters, visual and systemic. No adverse cardiovascular effect, no objectionable side effects, and no impairment of visual acuity or night vision were found. (Author)

A68-12155 *
AMINOPEPTIDASE PROFILES OF VARIOUS BACTERIA.
J. W. Westley, P. J. Anderson, V. A. Close, B. Halpern, and E. M. Lederberg (Stanford University, School of Medicine, Genetics Dept., Palo Alto, Calif.).
Applied Microbiology, vol. 15, July 1967, p. 822-825. 8 refs.
PHS Grant No. AI-5160; Grants No. NsG-81-60; No. NsG-05-020-004.

The aminopeptidase specificity of 24 strains of bacteria was determined fluorometrically by use of a series of α-amino acid β-naphthylamides as substrates. Provided that strict control over medium and growth time was adhered to, a reproducible profile of aminopeptidase activity was obtained which could be used for the identification of bacteria. (Author)

A68-12160 *
BIOSYNTHESIS OF CAROTENOIDS IN FLAVOBACTERIUM DEHYDROGENANS ARNAUDI.
Owen B. Weeks and Ronnie J. Garner (New Mexico State University, Research Center and Dept. of Biology, Las Cruces, N. Mex.).
Archives of Biochemistry and Biophysics, vol. 121, July 1967, p. 35-49. 28 refs.
PHS Grant No. ROI-AM-9400; Grant No. NGR-32-003-027.

The nonphotosynthetic, gram-positive bacterium, Flavobacterium dehydrogenans, requires continuous light and aerobic cultural conditions to produce its unique carotenoids. Biosynthetic reactions leading to a phytoene-like compound are controlled by light and terminal carotenoid biosynthesis by exogenous metabolites and aeration. Cultures grown in synthetic media contain essentially one carotenoid, designated dehydrogenans-P439. The compound has been partially characterized. With less favorable cultural conditions a series of carotenoids form, some of which are precursors to the principal carotenoid while other of the compounds characterize an alternate biosynthetic pathway. (Author)

A68-12163 *
COMPOUND CONDITIONING - EFFECTS OF COMPONENT INTENSITY ON ACQUISITION AND EXTINCTION.
Charles P. Thompson and Gary W. Van Hoesen (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.).
Journal of Comparative and Physiological Psychology, vol. 64, no. 1, 1967, p. 128-132. 8 refs.
Research supported by the Bureau of General Research; Grants No. NsG(T)-54; No. NsG(T)-17-001-002.

Study of compound conditioning, as manifested by rats which were conditioned to avoid a compound stimulus and were then extinguished to one of the components of the compound. Four acquisition conditions represented combinations of two-tone and two-light intensities in a tone-and-light compound stimulus. Response strength following acquisition, as measured by resistance to extinction of a component in a compound stimulus, varied both with the intensity of the component itself and with the intensity of the other component in the compound. The results suggest that an increase in the "overall intensity" of the compound increases the rate of acquisition. R.B.S.

A68-12167 *
ACOUSTICALLY EVOKED POTENTIALS IN THE RAT DURING CONDITIONING.
Roger G. Mark and Robert D. Hall (Massachusetts Institute of Technology, Research Laboratory of Electronics, Cambridge, Mass.).
Journal of Neurophysiology, vol. 30, 1967, p. 875-892. 42 refs.
NSF Grant No. GK-835; NIH Grant No. MH-04737-06; Contract No. DA-36-039-AMC-03200(E); Grants No. NsG-496; No. NsG-22-009-019.

Results of experiments in which click-evoked potentials were recorded from several auditory structures and from the mesencephalic reticular formation of rats, as a result of which a conditioned emotional response (CER) was established. Click-evoked potentials exhibited changes in amplitude. It is concluded that the observed changes in evoked potentials during aversive conditioning are not related to associative factors, or to acquired conditional or discriminative properties of the acoustic stimulus, but to some more general factor that is frequently correlated with the CER. M.F.

A68-12203
A WORST-CASE ANALYSIS OF CONTINUOUS WAVE He-Ne LASER HAZARDS TO THE EYE.
W. P. Hansen, L. Feigen, and S. Fine (Northeastern University, Dept. of Biophysics and Biomedical Engineering, Boston, Mass.).
Applied Optics, vol. 6, Nov. 1967, p. 1973-1975. 12 refs.
Army-PHS-supported research.

Worst-case conditions for threshold injury on direct viewing of a CW He-Ne laser are defined. A transpupillary power of 50-100 μw for threshold injury to the eye is calculated on the basis of a heat conduction model and experimental observations. (Author)

A68-12212 *
CONTROL OF CHLOROPHYLL PRODUCTION IN RAPIDLY GREENING BEAN LEAVES.
Merrill Gassman and Lawrence Bogorad (Chicago, University, Dept. of Botany, Chicago, Ill.).
Plant Physiology, vol. 42, June 1967, p. 774-780. 42 refs.
NSF-NIH-supported research; Grants No. NsG(T)-2; No. NsG(T)-14-001-015.

The possible involvement of nucleic acid and protein synthesis in light-regulated chlorophyll formation by rapidly greening leaves has been studied. Removing leaves from illumination during the phase of rapid greening results in a reduction in the rate of pigment synthesis; cessation occurs within 2 to 4 hr. Etiolated leaves which exhibit a lag in pigment synthesis when first placed in the light do not show another lag after a 4-hr interruption of illumination during the phase of rapid greening. Actinomycin D, chloramphenicol, and puromycin inhibit chlorophyll synthesis when applied before or during the phase of rapid greening. Application of δ-aminolevulinic acid partially relieves the inhibition by chloramphenicol. It is suggested that light regulates chlorophyll synthesis by controlling the availability of δ-aminolevulinic acid, possibly by mediating the formation of an enzyme of δ-aminolevulinate synthesis. This process may result from gene activation or derepression; the involvement of RNA synthesis of some sort is suggested by the inhibitory effect of actinomycin D on chlorophyll production by rapidly greening leaves. (Author)

A68-12213 *

CORRECTION FOR GUESSING IN CHOICE REACTION TIME.

John I. Yellott, Jr. (Minnesota, University, Minneapolis, Minn.).

Psychonomic Science, vol. 8, no. 8, 1967, p. 321, 322.
Research supported by the University of Minnesota; Grant No. NGR-24-005-063.

Additional theoretical and experimental results are presented for a choice reaction time performance model described by Ollman (1966). A formula is given for estimating the latency distribution of true recognition responses from the results of a single session; the estimate is invariant with respect to changes in the proportion of "guess" responses and with respect to fluctuations in the latency distribution of guesses. (Author)

A68-12278

THE EFFECTS OF DIVIDED ATTENTION ON VISUAL MONITORING OF MULTI-CHANNEL DISPLAYS.

John D. Gould and Amy Schaffer (International Business Machines Corp., Thomas J. Watson Research Center, Yorktown Heights, N.Y.).

Human Factors, vol. 9, June 1967, p. 191-201. 22 refs.

The study investigated the effects of divided attention on monitoring multichannel alphameric displays for signals defined on the basis of the simultaneous values of all channels - i.e., multichannel signals as opposed to single-channel signals. Variables investigated include (1) three methods of dividing attention (a short writing task, a long writing task, and blanking out the display); (2) number of channels monitored (4, 8, 12, and 16); (3) rate of display change (6 or 12 times per minute); (4) number of different signals simultaneously watched for (8 or 24); and (5) number of levels within channels (2 or 8). The main results were (1) divided attention did not lead to a decrease in monitoring, compared to a control study without divided attention; (2) the rate of display change had the greatest effect upon performance, followed by the number of channels monitored; (3) even at the faster rate of display change, untrained subjects detected 80% or more of the signals when they monitored up to 12 channels; and (4) different methods used to divide attention affect performance differentially. (Author)

A68-12279 *

HUMAN OPERATOR RESPONSE SPEED, FREQUENCY, AND FLEXIBILITY - A REVIEW AND ANALYSIS.

Michael J. Wargo (Dunlap and Associates, Inc., Western Div., Santa Monica, Calif.).

Human Factors, vol. 9, June 1967, p. 221-238. 108 refs.
Contract No. NAS 12-103.

Analysis of the innate limitations on human-operator manual-control speed, frequency, and flexibility. Advanced manual-control methods for overcoming these limitations are suggested, and research relating to them is reviewed. It is concluded that a considerable increase in human-operator response speed, frequency, and flexibility could accrue from the use of the suggested manual-control techniques. B.B.

A68-12280

EFFECTIVENESS OF SIDE-LOOKING RADAR IN SIMULATED ORBIT AS A FUNCTION OF REFERENCE DATA SUPPORT.

Hugh E. Cahill and Robert S. Luce (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).

Human Factors, vol. 9, June 1967, p. 239-250. 7 refs.
Research supported by Lockheed Independent Development Funds.

Evaluation of the ability of a subject to identify ground targets through side-looking radar (SLR) imagery from a simulated space orbit. Two levels of target localization data (precise vs general) are provided on a reference display either simultaneously with, or immediately in advance of target presentation on an adjacent TV monitor. It is concluded that precise target localization, as may be provided by preflight intelligence or in-flight information from forward-looking sensors, is especially important in supporting target-identification by SLR at near real-time rates. B.B.

A68-12282 #

SIGNAL DETECTION THEORY IN THE ANALYSIS OF HUMAN VIGILANCE.

Harry J. Jerison (Antioch College, Behavior Research Laboratory, Yellow Springs, Ohio).

Human Factors, vol. 9, June 1967, p. 285-288. 11 refs.
Contract No. AF 33(615)-67-C-1280.

Analysis of several recent experimental and theoretical reports on vigilance which use the theory of signal detectability (TSD). The psychological interpretation of the TSD measure of criterion, β, as an index of the conservativeness during a vigil does not appear to be valid. As computed, β is probably an artifact due to pooling observations made under different conditions of attentiveness during a long vigil. B.B.

A68-12302

RADIANT ELECTROMAGNETIC ENERGY AND LIFE.

E. R. Graf (Auburn University, Dept. of Electrical Engineering, Auburn, Ala.) and F. E. Cole (Louisiana State University, Medical Center, Dept. of Biochemistry, New Orleans, La.).

IN: ENGINEERING SCIENCE IN SPACE; SOCIETY OF ENGINEERING SCIENCE, TECHNICAL MEETING, 5TH, HUNTSVILLE, ALA., OCTOBER 30-NOVEMBER 1, 1967, TECHNICAL PAPERS. [A68-12298 02-32]
Meeting supported by the Boeing Co., the Brown Engineering Co., the International Business Machines Corp., the Rohm and Haas Co., NASA, and the University of Alabama.
Huntsville, Ala., Society of Engineering Science, Inc., 1967, p. 33-51. 30 refs.

Examination of the concept of the emergence of life through abiogenic evolution in terms of the hypothesis of planetary resonance. The planetary-resonator theory, based on fundamental electromagnetic phenomena, describes a particular phase in the evolution of certain planets (between their formation and the development of surface features) during which their cooling rates are markedly attenuated. The theory maintains that a planet may foster an electromagnetic phenomenon wherein the planet-charge-layer cavity constitutes a vast, concentric spherical resonator functioning within a natural oscillator excited by magnetic fields and associated Van Allen-belt currents. The existence of this planetary resonator during the Precambrian era indicates that the first terrestrial organisms emerged under conditions markedly different than heretofore hypothesized. A critical evaluation of experimental chemical abiogenesis during the past decade is given, and a theoretical outline of the origin of the first organism is proposed on the basis of planetary-resonance considerations. T.M.

A68-12345 *

HIPPOCAMPAL STATES AND FUNCTIONAL RELATIONS WITH CORTICOSUBCORTICAL SYSTEMS IN ATTENTION AND LEARNING.

W. R. Adey (California, University, Dept. of Anatomy and Dept. of Physiology and Center for Health Sciences, Brain Research Institute, Los Angeles, Calif.).

IN: STRUCTURE AND FUNCTION OF THE LIMBIC SYSTEM. Edited by Ross Adey and T. Tokizane.
Amsterdam, Elsevier Publishing Co. (Progress in Brain Research. Volume 27), 1967, p. 228-245. 41 refs.
NIH Grants No. NB-01883; No. MH-03708; Contracts No. AF 49(638)-1387; No. Nonr-233(91); Grants No. NsG-502; No. NsG-05-007-011.

Study of the role of the hippocampus in learning, with particular reference to the intimate aspects of its intrinsic electrical activity and simultaneous relations with other brain structures. Impedance measurements are used to study changes in the tissue states in the hippocampus and in the amygdala and midbrain reticular formation in the course of behavioral training with separate alerting, orienting, and discriminating stimuli. Also studied are differential regional responses relating to these stimuli at different levels of training and in cue reversals with retraining. The findings are seen to support the view that impedance changes that are evoked in this way relate to the process of information storage in the tissue, rather than to nonspecific aspects of total tissue activity, as suggested by Jasper (1965). A discussion of the relationship of impedance responses to the normal neuronal content of the tissue is included. V.P.

A68-12545
LIFE AT HIGH TEMPERATURES.
Thomas D. Brock (Indiana University, Bloomington, Ind.).
Science, vol. 158, Nov. 24, 1967, p. 1012-1019. 82 refs.
AEC-supported research; NSF Grant No. GB-5258.

Study of thermal environments for living organisms with a special emphasis on high-temperature environments. The high-temperature environments most useful for this study are those associated with volcanic activity, such as hot springs. Visible algal growth (of the unicellular blue-green Synechococcus) was found to exist at temperatures up to 75°C. Bacterial growth in superheated pools at Yellowstone National Park has been observed at temperatures up to 95.5°C. The conclusion is reached, however, that the upper temperature for life, as known to science, has not as yet been defined. P.v.T.

A68-12577 *
ORGANIC GEOCHEMICAL STUDIES. I.
Eugene D. McCarthy and Melvin Calvin (California, University, Laboratory of Chemical Biodynamics and Space Sciences Laboratory, Berkeley, Calif.).
Nature, vol. 216, Nov. 18, 1967, p. 642-647. 52 refs.
NASA-AEC-sponsored research.

Formulation of criteria for differentiating molecules derived from biological systems from those which originate from non-biological processes. One important reason for establishing such criteria is that they can be used to determine whether life exists, or has existed, on other planets. It is noted that recent findings raise serious questions about the validity of the isoprenoid compounds as biological markers. It is pointed out that molecules which consist of isoprene units have been particularly important for distinguishing between chemicals produced by inorganic means and those which are the product of living processes, and that abiogenic construction now seems possible. The possibility of non-biogenic isoprenoid hydrocarbons is a very real one, and criteria must be established for distinguishing between those derived from an abiogenic origin and those derived from biological systems. M.M.

A68-12578 *
THERMAL POLY-α-AMINO-ACIDS CONTAINING LOW PROPORTIONS OF ASPARTIC ACID.
Duane L. Rohlfing (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).
(American Chemical Society, National Fall Meeting, New York, N.Y., Sept. 11-16, 1966, Paper.)
Nature, vol. 216, Nov. 18, 1967, p. 657-659. 15 refs.

Description of a method for preparing proteinoids which contain a very low proportion of aspartic acid, using conditions which do not result in diminished yields or dark products. These polymers were obtained from reactants which contained lower proportions of aspartic acid than normally used, but which were augmented with lysine free base. Less satisfactory results were obtained when lysine was omitted or used as the hydrochloride salt. The investigation showed that the addition of lysine free base to reactants comprised predominantly of dicarboxylic amino-acids leads to thermal condensation products of which the contents of aspartic acid can be easily controlled without adversely affecting either the yield or appearance of the product. M.M.

LC ENTRIES

A68-80001
CONTINUOUS MEASUREMENT OF PARTITION OF PULMONARY BLOOD FLOW BETWEEN RIGHT AND LEFT LUNG.
Shigekoto Kaihara, George E. Kandel, and Henry N. Wagner, Jr (Johns Hopkins Med. Inst., Div. of Nucl. Med., Baltimore, Md.)
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 976–978. 6 refs.
Grant PHS GM 10548.

A technique for continuous measurement of the partition of pulmonary arterial blood flow between right and left lungs of anesthetized dogs is described. ^{133}Xe in isotonic solution is infused continuously into a peripheral vein. A Carlens' catheter is used to direct the air expired from each lung through coils that surround sodium iodide crystal-scintillation detectors. The radioactivity of the ^{133}Xe evolved from each lung is recorded continuously and serves as an index of the pulmonary arterial blood flow.

A68-80002
SUBNORMAL CARDIAC OUTPUT AT REST AND DURING EXERCISE IN RESIDENTS AT 3,100 M ALTITUDE.
L. Howard Hartley, James K. Alexander, Michael Modelski, and Robert F. Grover (Colo. U., Med. Center, Dept. of Med., Denver and Baylor U., Coll. of Med., Dept. of Med., Houston, Tex.)
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 839–848. 31 refs.
Contract DA-49-193 MD 2551, Grants PHS HE-08728, PHS HE-05435, PHS HE-32645, PHS HTS-5345, and PHS K3-HE-29,237.

The cardiac output response to submaximal supine leg exercise was investigated in ten healthy men who had lived at 3,100 m. altitude for 4–32 yr. Using the direct Fick method for oxygen, cardiac output was measured at rest and during four work loads requiring oxygen uptakes of 600–1,600 ml./min.These measurements were repeated using exactly the same work loads after the subjects had been at sea level for ten days. By normal sea-level standards these men had subnormal cardiac outputs at high altitude, both at rest and during exercise. Cardiac output increased somewhat (8%) at low altitude. Stroke volume increased 15% after ten days at sea level, but oxygen administration at high altitude produced no increase in stroke volume. Neither pulmonary hypertension nor polycythemia was present to influence cardiac output at high altitude. Changes in pulmonary vascular resistance acid-base balance, sympathetic activity, blood volume, or ventricular-filling pressure did not account for the observed subnormal response. The hypothesis is advanced that a depressant effect of chronic hypoxia upon the ventricular myocardium could result in reduced myocardial contractile force and stroke volume.

A68-80003
REDUCTION OF STROKE VOLUME DURING EXERCISE IN MAN FOLLOWING ASCENT TO 3,100 M ALTITUDE.
James K. Alexander, L. Howard Hartley, Michael Modelski, and Robert F. Grover (Baylor U., Coll. of Med., Dept. of Med., Houston, Tex. and Colo. U., Med. Center, Dept. of Med., Denver).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 849–858. 20 refs.
Contract DA-49-193-MD-2551, Grants PHS HE-08728, PHS HE-05435, PHS HE-32645, PHS HTS-5345, and PHS K3-HE-29,237.

The cardiac output response to submaximal supine leg exercise was determined in eight normal subjects, first at sea level and again after ten days at 3,100 m. Using the direct Fick method for oxygen, cardiac output was measured at rest and during four work loads requiring oxygen uptakes of 600–1,600 ml./min. at both altitudes. At rest and at each level of exercise, cardiac output was less at 3,100 m., by as much as two liters/min. Reduced cardiac output was chiefly due to decrease in stroke volume. Though blood volume was less at high altitude, acute plasma volume expansion with dextran in two subjects failed to restore stroke volume to sea-level values. The reduction of stroke volume was apparently not a result of altered blood pH, pulmonary hypertension and right ventricular overload, depletion of myocardial norepinephrine stores, diminished sympathetic nervous activity, or reduction in blood volume and ventricular filling pressures. Myocardial function was probably depressed by hypoxia secondary to lowered coronary arterial oxygen tension, reduced coronary blood flow, or both.

A68-80004
POSTURAL EFFECTS ON LOBAR PULMONARY AND SYSTEMIC FLOW: A FLOWMETER STUDY IN DOGS.
Warren G. Guntheroth, Beverly C. Morgan, and John P. Lintermans (Wash. U., School of Med., Dept. of Pediat., Seattle).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 859–864. 15 refs.
Grants PHS HE-03998, PHS HE-07158, PHS HE-7945, and PHS T1HE-5281.

Lightweight, pulsed ultrasonic flow transducers were chronically implanted on the upper and lower left pulmonary arteries and thoracic aorta in 13 dogs. In four animals diameter of the lower pulmonary vein was monitored by miniature mutual inductance coils. The head-up position caused a consistent decrease in upper lobe and systemic flow, but less than one-third showed the expected increase in lower lobe flow. Pulmonary vein diameter decreased. The head-down position caused an increase in flow to the upper lobe, but no consistent change in lower lobe or systemic flow or pulmonary vein diameter. Changes in cardiac output may explain some of the results, but not the unexpected failure of the lower lobe flow to diminish in the head-down position. Simple hydrostatic concepts also fail to explain this phenomenon, since the basal segments in the dog are further removed from the main pulmonary artery than the apical segments, which should make flow in the basal segments more vulnerable to gravity than in the apical segments.

A68-80005
CARDIOVASCULAR EFFECTS OF FACE IMMERSION AND FACTORS AFFECTING DIVING REFLEX IN MAN.
Yoshikazu Kawakami, Benjamin H. Natelson, and Arthur B. DuBois (Pa. U., Div. of Graduate Med., Dept. of Physiol., Philadelphia).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 964–970. 25 refs. .
Contract NADC N62269-3804 and NIH supported research.

Effects of face immersion on the cardiovascular system and the factors affecting the diving reflex were examined in 15 human subjects. During face immersion with breath holding the cardiac index decreased 22% ($P<0.001$) and stroke index decreased about 14% ($P>0.05$). The former decrease was accompanied by a significant decrease in heart rate. Brachial blood pressure increased more during face immersion with breath holding in cold (10–17°C.) or slightly cool (30–37°C.) water than it did during simple breath holding or application of an ice bag to the face. An analysis of pressure-wave contours was suggestive that peripheral vasoconstriction occurred most markedly during cold-water immersion. Heart rate was lowest during breath holding with face immersion in cold water irrespective of moderate changes in esophageal pressure and lung volume. Inhalation of asphyxic gases

suggested that asphyxia is not a major factor in evoking the diving reflex. Cold receptors in the face may be the most effective trigger. Hypercapnia, however, followed by hypoxia during breath holding may contribute to the maintenance of the diving bradycardia.

A68-80006
CHRONIC RECORDING OF ECG AND DIAPHRAGMATIC EMG IN RATS.

Stephen A. Weinstein, Zoltan Annau, and Gordon Senter (Johns Hopkins U., Dept. of Psychiat. and Environ. Med., Baltimore, Md.)

Journal of Applied Physiology, vol. 23, Dec. 1967, p. 971–975. 11 refs.
NASA Grant NGR-21-001-035, Contract DA 49-193-MD-2726, Grants NIH HE 10342-01, W H.18-2062, and W-L H.19-2063.

This paper describes a technique for long-term recording of diaphragmatic electromyogram (EMG) and heart rate in unrestrained rats. The relationship of the diaphragmatic EMG to ventilation in the awake and anesthetized rat at several levels of ventilation was determined. A new connector assembly and subcutaneous lead is described. The preparation permits quantifiable, durable, and relatively artifact-free measurement of respiration and heart rate.

A68-80007
MEASUREMENT OF THE WATER VAPOR LOSS FROM HUMAN SKIN BY A THERMAL CONDUCTIVITY CELL.

D. Spruit (Catholic U., Dept. of Dermatol., Nijmegen, The Netherlands).

Journal of Applied Physiology, vol. 23, Dec. 1967, p. 994–997. 6 refs.

A thermal conductivity cell was applied as a humidity sensor in the determination of the insensible perspiration of 2 $cm.^2$ human forearm skin. The cell was calibrated with the use of dried and of humid air from the surrounding atmosphere, resulting in very much the same values. If humid environmental air is used as a carrier gas, the skin need not be conditioned and the time needed for measuring the water vapor loss of human skin is only one-fifth of the time needed when methods with a dried gas are applied.

A68-80008
BRAIN STEM EVOKED RESPONSES ASSOCIATED WITH LOW-INTENSITY PULSED UHF ENERGY.

Allan H. Frey (Inst. for Res., State College, Pa.)

Journal of Applied Physiology, vol. 23, Dec. 1967, p. 984–988. 12 refs.
ONR and Army supported research.

Evoked potentials in the brain stem of cats were induced by illumination with pulse-modulated UHF energy. The threshold power density necessary to evoke the potentials was approximately 30 $\mu w/cm.^2$ average and 60 $mw/cm.^2$ peak. The data indicate that the potentials were neural rather than an artifact of the situation. Using an echosorb shield to cover the entire cat, or head, or body, it was found that the head must be exposed to the UHF energy in order to have an effect occur. Within the carrier-frequency range used (1.2–1.525 Gc), there appeared to be a reduction of effect at the highest frequency. Variation in power density has a distinct effect on the evoked potential. Polarization of the energy, whether perpendicular or parallel to the spine, does not seem to have much effect through this is not unequivocal. As pulse-repetition frequency (PRF) is changed, the evoked potential does not change significantly until the PRF is greater than approximately 50 pulses/sec. When greater than this, there is often an overlap of activity evoked by the series of stimuli. In general, an electrode placed in the rostral brain stem does not yield evoked activity as diffuse and persistent as an electrode placed in the caudal portion of the reticular formation.

A68-80009
CENTER OF GRAVITY, CENTER OF PRESSURE, AND SUPPORTIVE FORCES DURING HUMAN ACTIVITIES.

M. P. Murray, A. Seireg, and R. C. Scholz (Wis. U., Dept. of Mech. Eng., Madison; Marquette U., School of Med., Milwaukee; and Veterans Admin. Center, Phys. Med. and Rehabil. Serv., Kinesiol. Res. Lab., Wood).

Journal of Applied Physiology, vol. 23, Dec. 1967, p. 831–838. 21 refs.
Grant PHS CD 00052-01.

The magnitude and orientation of the vertical supportive force were measured with a force platform during the following activities of a normal male: descending to and ascending from squatting and seated postures, and jumping. Simultaneous photographic records were made of the displacements of the mass centers of body segments. This combination of methods has provided a unique means to: (1) compare vertical forces calculated from the photographic records with the force-platform measurements, (2) differentiate between changes in the applied force and changes in the position of the center of gravity of the body, and (3) differentiate between the excursions of the line of gravity and the action line of the vertical supportive force (center of pressure). The vertical force fluctuated above and below body weight during all test activities. The calculated force patterns approximated the measured patterns. Distinctly different pathways were seen for the center of pressure and the line of gravity with the former fluctuating and the latter moving smoothly. The interaction between the two suggests a fundamental servomechanism operable in the control of human posture and motion.

A68-80010
ELECTROPHYSIOLOGICAL STUDY OF VISUAL CORTICAL MECHANISMS ACTIVATED DURING AVOIDANCE CONDITIONING TRIALS IN MACAQUES.

G. F. Ricci, F. Valassi, and L. Zamparo (Rome U., Fac. di Farm., Ist. di Farmacol. e Farmacognosia, Italy).

Archives Italiennes de Biologie, vol. 105, Sep. 1967, p. 413–435. 36 refs.
Grant AF-EOAR 64-40.

The cortical activating mechanisms accompanying a well-defined, stereotyped behavioral procedure were studied, and an attempt was made to define the extent to which these activating mechanisms may influence the amplitude and configuration of peripherally evoked cortical responses. A large enhancement of the visual cortical responses to geniculate shocks occurred after onset and termination of photic conditioning stimuli in macaques. A similar enhancement was found to occur also after the onset, but not after termination, of conditioning trials to acoustic stimuli. These changes of cortical responsiveness preceded and accompanied the onset of the conditioned motor response but were independent of the motor aspect of conditioning, since they were observed also during differentiation. The enhancement of the visual responses to geniculate shocks was not modified after overtraining. At the onset of conditioning trials to sound, the photic evoked responses underwent a regularization and a slight increase in amplitude. The timing of these changes was approximately similar to that of the enhancement of the responses to geniculate shocks described above. These modifications of photic responses were not related to variations in size of the pupils. The results indicated that these changes were due to activating effects at the level of the visual cortex, which accompanied the animal's attention and arousal.

A68-80011
SWEATING IN CHRONIC ROSTROCORTICAL AND CAUDOCORTICAL CATS.

M. Murray and G. H. Wang (Wis. U., Med. School, Lab. of Neurophysiol., Madison).
Archives Italiennes de Biologie, vol. 105, Sep. 1967, p. 393–398. 5 refs.
Grants NIH B1460 and NIH NB06225.

The skin potentials in the footpads of four rostrocortical (rostral cortical areas intact; areas caudal to sensorimotor regions removed) and four caudocortical (rostral cortical areas removed; areas caudal to sensorimotor regions intact) cats were observed repeatedly during survival times of from four to six mo. The skin potentials of the rostrocortical cats were consistently of low amplitude and of high frequency, whereas those of the caudocortical cats showed high amplitude and low frequency. The footpads of the former were dry, whereas those of the latter were always wet. These results together with previous findings from electrical stimulation of the rostral pole of the cerebral hemisphere strongly indicate that the rostral pole has inhibitory, but the neocortex caudal to it has facilitatory, action on sweating in the footpads of the cat.

A68-80012
SWEATING UNDER DIFFERENT AMBIENT TEMPERATURES IN NORMAL, STRIATAL AND THALAMIC CATS.
G. H. Wang and R. W. S. Chun (Wis. U., Med. School, Dept. of Neurol. and Lab. of Neurophysiol., Madison).
Archives Italiennes de Biologie, vol. 105, Sep. 1967, p. 379–392. 31 refs.
Grants NIH B-1460 and NIH NB-06225.

The effects of three different ambient temperatures on the potential waves in the footpads of normal, striatal and thalamic cats were studied. At the neutral ambient temperature (25°C.), the potential waves in the footpads of normal, striatal and thalamic cats were similar to those observed previously at room temperature (20° to 25°C.). At the high ambient temperature (40°C.), the potential waves in the footpads of normal and striatal cats were increased in frequency but markedly decreased in amplitude, whereas those on the footpads of thalamic cats were perfectly synchronized with a slight reduction in amplitude. At the low ambient temperature (10°C.), the potential waves in normal, striatal and thalamic cats were all decreased in frequency and amplitude. The electrodermal reflex of normal cats to the noise of an electric buzzer was reduced in amplitude with no change in latency at high ambient temperature, and was reduced in amplitude but prolonged in latency to a great extent by low ambient temperature. The mechanisms of these findings and their bearings on present day experiments and theory of thermoregulation in mammals were briefly discussed.

A68-80013
CENTRAL AND PERIPHERAL MECHANISMS IN THE MODULATION OF FLASHING IN THE FIREFLY *LUCIOLA ITALICA L.*
F. Magni (C.N.R., Gruppo Operativo di Neurofisiol., Gruppo Nazl. di Med. Sper., Pisa and Pisa U., Ist. di Fisiol., Italy).
Archives Italiennes de Biologie, vol. 105, Sep. 1967, p. 339–360. 12 refs.
Contract AF 61(052)-830.

The effects of photic and electrical stimulation of the ventral cord on flashing of *Luciola italica* were investigated, and possible mechanisms analyzed. Spontaneous flashing of *L. italica* was depressed by photic stimulation of high intensity and facilitated by photic stimulation of low intensity. Spontaneous flashing was facilitated by high rate electrical stimulation and depressed by low-rate electrical stimulation of the ventral cord. Peripheral flashes, evoked by electrical stimulation of the lantern, were inhibited by strong photic stimulation. Peripheral flashes, evoked by electrical stimulation of the lantern in the decapitated firefly were increased and depressed following stimulation of the ventral cord respectively at high and low rates. The discussion of these results led to the conclusion that neural mechanisms acting at the level of the central pacemaker and of the peripheral organ are responsible for the photic modulation of flashing.

A68-80014
NERVOUS CONTROL OF FLASHING IN THE FIREFLY *LUCIOLA ITALICA L.*
M. Buonamici and F. Magni (C.N.R., Gruppo Operativo di Neurofisiol., Gruppo Nazl. di Med. Sper., Pisa and Pisa U., Ist. di Fisiol., Italy).
Archives Italiennes de Biologie, vol. 105, Sep. 1967, p. 323–338. 25 refs.
Contract AF 61(052)-830.

The physiology of the photogenic organ of *Luciola italica* was investigated to determine whether or not the mechanism of flashing is under nervous control. It was found that: (1) spontaneous flashes in *L. italica* are triggered by nerve volleys descending from the brain; (2) electrical stimulation of the photogenic organ elicits direct and reflex flashes; (3) direct flashes elicited in the deganglionated lantern are identical to spontaneous ones in form, duration and latency; their amplitude is proportional to the intensity of the stimulus; (4) repetitive stimulation of the deganglionated lantern elicits "staircase", incompletely and completely fused responses; and (5) a prolonged facilitation is set up by subliminal stimuli. The results were discussed in terms of neural control of flashing. It was concluded that the flashing is controlled by nervous mechanisms.

A68-80015
RELATIONSHIP BETWEEN RECTAL, VISCERAL AND MUSCLE TEMPERATURES DURING BODY TEMPERATURE ELEVATION.
Aryeh Man and Ezra Sohar (Govt. Hosp., Dept. of Clin. Res., Climatic Res. Unit, Tel-Hashomer and Tel Aviv U., Med. School, Israel).
Israel Journal of Medical Sciences, vol. 3, Jul.–Aug. 1967, p. 535–538. 14 refs.
Grant Ford Found., Israel F 5-3.

Temperature of different organs was recorded in mongrel dogs during body temperature elevation due to heat load or physical effort or both. It was found that the relationship between the temperature of the rectum and that of the liver, kidney and muscle does not change during elevation of body temperature. It seems that once the difference between the rectal temperature and that of other internal organs is established, it is possible to deduce the latter's temperature by measuring rectal temperature alone.

A68-80016
MODIFICATION OF HYPERBARIC OXYGEN TOXICITY BY EXPERIMENTAL VENOUS ADMIXTURE.
Peter M. Winter, Raj K. Gupta, Andrew H. Michalski, and Edward H. Lanphier (Mass. Gen. Hosp., Harvard Med. School, Anaesthesia Labs., Boston and N. Y. State U., Depts. of Physiol. and Pathol., Buffalo).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 954–963. 16 refs.
Contract Nonr 969(03), Grants PHS HE-06848-05 and PHS 5 TO1 GM 1273-03.

The development of oxygen poisoning was compared in ten normal dogs and in ten with large venoarterial shunts produced by anastomosis of the inferior vena cava to the right inferior pulmonary vein two wks. before exposure to oxygen. The control dogs breathed oxygen in a hyperbaric chamber at 2.5 atm. abs. until convulsions (5.1±SD 2.12 hr.) and at 2 atm. until death (total 12.3±1.4 hr.). The operated dogs were exposed to 2.5 atm. abs. for 5.1 hr. and to 2.0 atm. abs. until death. They experienced no

convulsions and survived 21.1±2.3 hr. ($P<0.001$). The lungs of both groups showed severe damage characteristic of pulmonary oxygen toxicity. Minimal lung changes were found in seven of eight operated dogs exposed on the same schedule but sacrificed at the median survival time of control dogs. Venous admixture largely prevented elevation of arterial oxygen tension (P_{O_2}) in the operated dogs during oxygen exposure. Delayed development of lung damage and near doubling of survival time are consistent with the hypothesis that pulmonary oxygen toxicity is not governed by alveolar oxygen pressure alone but involves factors related to arterial P_{O_2}.

A68-80017
EFFECTS OF TIME-VARYING BLOOD FLOW ON OXYGEN UPTAKE IN THE PULMONARY CAPILLARIES.

Edward D. Crandall and Raymond W. Flumerfelt (Notre Dame U., Depts. of Chem. Eng. and Eng. Sci., Ind.)

Journal of Applied Physiology, vol. 23, Dec. 1967, p. 944–953. 21 refs.

Previous procedures for determining the blood oxygen tension along the pulmonary capillaries have assumed, among other things, that the blood velocity in the capillaries is constant. It is probable, however, that this blood flow is actually pulsatile in nature, although little is known about the specific characteristics of the pulses. In this study, a model was developed which takes into account time-varying pulmonary capillary blood flow, while at the same time including the variations of over-all pulmonary diffusing capacity with blood oxygen tension and the nonlinear form of the oxyhemoglobin dissociation curve. The results indicate that pulsatile blood flow has a detrimental effect on the efficiency of the gas exchange process in the lungs.

A68-80018
ALTERATIONS IN TRACHEOBRONCHIAL SMOOTH MUSCLE ACTIVITY FOLLOWING MELATONIN.

I. Bruderman and R. Rahamimoff (Hadassah U. Hosp., Cardiopulmonary Labs., and Hebrew U.–Hadassah Med. School, Dept. of Physiol., Jerusalem, Israel).

Journal of Applied Physiology, vol. 23, Dec. 1967, p. 938–943. 14 refs.
Hebrew U.–Hadassah Med. School supported research.

The effect of melatonin, an indole isolated from the pineal body, on the tracheobronchial smooth muscle tone was tested in anesthetized, intact, and vagotomized dogs. In spite of being a derivative of 5-hydroxytryptamine, melatonin injected intravenously caused a marked decrease in lung resistance (RL) and an increase in lung compliance (CL). Moreover, a marked inhibitory action of this substance was noted on 5-hydroxytryptamine-induced bronchoconstriction. Following bilateral cervical vagotomy, the bronchodilatory and 5-hydroxytryptamine-inhibitory action of melatonin persisted, although the effect was less marked and of shorter duration. The local action of this substance was tested on the isolated cat trachea. No change in the tracheal smooth muscle tone was observed after melatonin was added to the preparation, but marked inhibition of 5-hydroxytryptamine-induced contractions was noted. The antagonism of these two substances is presumably competitive in nature, and a molecular ratio of melatonin: 5-hydroxytryptamine of 340 was found for 50% inhibition. It is suggested that the main action of melatonin is directly on the tracheobronchial smooth muscle. A possibility exists of a small indirect effect.

A68-80019
O_2 ALVEOLAR-ARTERIAL TENSION DIFFERENCE AFTER 10 DAYS RECUMBENCY IN MAN.

David Cardus (Baylor U., Coll. of Med., Depts. of Physiol. and Rehabil. and Tex. Med. Center, Tex. Inst. for Rehabil. and Res., Houston).

Journal of Applied Physiology, vol. 23, Dec. 1967, p. 934–937. 27 refs.
NASA Contract NAS9-1461 and Grant VRA RT-4.

This study was conducted on seven healthy men whose ages varied from 21 to 25 yr. Measurements of the O_2 alveolar-arterial tension difference ($(A\text{-}a)DO_2$) were made in the supine position before and after ten-days bed recumbency. The O_2 and CO_2 partial pressures were determined with the Clark and Severinghaus electrodes, respectively. The alveolar O_2 partial pressure was calculated from the alveolar equation. The $(A\text{-}a)DO_2$ increased in all the cases. The average $(A\text{-}a)DO_2$ before recumbency was 9 mm. Hg. The average $(A\text{-}a)DO_2$ after recumbency was 19 mm. Hg. This increase in the $(A\text{-}a)DO_2$ was due to a change in the alveolar oxygen tension which varied from 103 mm. Hg before recumbency to 94 mm. Hg after recumbency. The mechanism by which the $(A\text{-}a)DO_2$ increases with prolonged bed recumbency is discussed with regard to information obtained by other investigators from experiments conducted in animals or human subjects during anesthesia.

A68-80020
ELECTROCARDIOGRAPHIC CHANGES UNDER EXPERIMENTAL HYPOTHERMIA IN DOGS.

K. K. Sikka, J. Prasad, Tara Chandera, S. S. Mishra, S. S. Dalmia, and Nirmal Sardana (G.V.S.M. Med. Coll., Kanpur, India).

Indian Heart Journal, vol. 17, Jul. 1967, p. 184–192. 15 refs.

Electrocardiographic changes in healthy dogs under induced hypothermia at different temperatures from 35°C. or above down to 11°–15°C. have been reported. With lowering of body temperature, heart rate progressively slowed down and duration of P-R interval, QRS complex and Q-T interval progressively increased. Changes in the shape and duration of P wave and Q wave, and in QRS complexes and S-T segments along with a variety of cardiac arrhythmias were seen during hypothermia in dogs. Their significance in the light of recent work is discussed.

A68-80021
THE ALCOHOL PROBLEM.

G. W. McCarthy (Long Island Council on Alcoholism, Inc., N. Y.)

Air Line Pilot, vol. 36, Oct. 1967, p. 9, 18, 23.

The problem of alcoholism was discussed with special emphasis on the civil aviation industry. It was suggested that the Federal Aviation Agency ruling on alcoholism be amended, and that all flight training and flight safety schools include an intensive training seminar dealing with the problem of alcoholism.

A68-80022
INSTRUMENTAL DESIGN IN ANALYSIS OF $^{14}CO_2$ IN EXPIRED AIR IN MAN.

R. Blomstrand and G. Carlberger (Karolinska Inst., Serafimerlassarettet, Dept. of Clin. Chem., Stockholm, Sweden).

Scandinavian Journal of Clinical and Laboratory Investigation, vol. 19, no. 4, 1967, p. 313–318. 11 refs.
Grant PHS HE 07663; Swed. Med. Res. Council and Svenska Margarinind. förening för Näringsfysiol. forskning supported research.

An apparatus with two alternative flow systems for continuous determination of $^{14}CO_2$, CO_2, and O_2 in expired air from human subjects is described. $^{14}CO_2$ excretion has been determined by an ionization chamber, and CO_2 excretion by a pCO_2 electrode or by means of infrared absorption. Some problems concerning clinical radiorespirometric investigation are discussed.

A68-80023
SIGNAL-DETECTION THEORY APPLIED TO SELECTIVE LISTENING.
Neville Moray and T. O'Brien (Sheffield U., Dept. of Psychol., Yorkshire, Great Britain).
Journal of the Acoustical Society of America, vol. 42, Oct. 1967, p. 765–772. 13 refs.
Sci. Res. Council supported research.

Recently, two papers have appeared that have applied signal detection theory to selective listening. Both have certain defects, and the present paper is intended to clarify some of the issues raised by the earlier papers. One group of experiments used a tone detection task on one ear while presenting a memory load to the other and found that d' but not β altered for the detection task. Another group recently reported on the "shadowing" situation (continuous repetition of an ongoing message) and again found evidence that d' but not β was affected. The results were interpreted to mean that selection of input, not of response, was operative, basing the conclusion on the way in which the subject responded to homophones and homonyms. Detection of signals was signaled by the subject tapping the microphone. Unfortunately, pooled data was used for the estimation of d' and β, which involved some strong assumptions about the relative performance of individual subjects. The present experiment was designed to provide a relatively "pure" selective listening task for the applicability of signal detection theory to the process of selective attention.

A68-80024
SIMPLE METHOD FOR IDENTIFYING ACCEPTABLE NOISE EXPOSURES.
James H. Botsford (Bethlehem Steel Corp., Pa.).
Journal of the Acoustical Society of America, vol. 42, Oct. 1967, p. 810–819.

A simple method for identifying acceptable noise exposures has been developed from the National Academy of Science–National Research Council Committee on Hearing, Bioacoustics, and Biomechanics report describing hazardous exposures to intermittent and steady-state noise. First, an interrupted exposure was imagined in which the noise dropped to harmless levels periodically, thereby creating a number of identical exposure cycles distributed uniformly throughout the day. Next, the total duration of noise allowable per day was calculated for 39 different patterns of interrupted exposure using the CHABA graphs. This total noise duration permissible daily increased rapidly with the number of interruptions, passed through a maximum value for interruptions about five min. in length, and became constant for noise interrupted every two min. or oftener. Nine general contours of equinoxious octave-band sound pressure levels evolved from this analysis, and the A-weighted sound level equivalent to each contour was determined for noises of manufacturing industries. It is concluded that acceptable manufacturing-noise exposures can be identified as accurately by using A-weighted sound levels as is possible by using octave-band sound-pressure levels.

A68-80025
EFFECT OF THE FLICKER FREQUENCY OF LIGHT AND OTHER FACTORS ON THE SYNTHESIS OF PROTEINS IN THE OCCIPITAL CORTEX OF MONKEY.
U. B. Singh and G. P. Talwar (All-India Inst. of Med. Sci., Dept. of Biochem., New Delhi).
Journal of Neurochemistry, vol. 14, Jun. 1967, p. 675–680. 7 refs.
Indian Council of Med. Res. and Council of Sci. and Ind. Res. supported research.

Monkeys were exposed to light of known intensity and flicker frequency. In parallel experiments a set of monkeys were kept in darkness for the same time period. The incorporation of L[U–^{3}H]lysine, injected into the cisterna magna, into proteins of the occipital cortex (areas 17, 18 and 19) was studied in the two cases. There was continuous synthesis of proteins in the occipital cortex irrespective of whether the monkey was kept in darkness or exposed to light. Exposure of the animal to a rhythmically flickering source of light with a flicker frequency of 7/sec. induced a higher incorporation of the radioactive amino acid into proteins of the occipital cortex than the values obtained for the animal kept in darkness. The influence of the intensity of light, the flicker frequency of the light, the color of the incident light and the time of exposure of the animal to light were studied and conditions were defined in which a sensory stimulus caused an increased synthesis of proteins in a corresponding area of the cerebral cortex.

A68-80026
STUDIES ON THE VISUAL EVOKED RESPONSE (VER).
Morio Taniguchi (Mie Prefectural U., School of Med., Dept. of Ophthalmol., Tsu-Shi, Japan).
Japanese Journal of Ophthalmology, vol. 11, Jan. 1967, p. 36–51. 10 refs.

The retino-cortical time and the time relation between the electroretinogram and the activity of the optic nerve was investigated in unanesthetized albino rabbits. A 10 μsec. flash of light was used as a stimulus. The results obtained are as follows: (1) The retino-cortical time obtained by measuring the time between the peak latency of the a_1-wave and the latency of the visual evoked response was 8.7 ± 0.96 msec. (2) The impulse discharge of the retinal ganglion cell and the optic nerve response consistently occurred with some delayed intervals in relation to the peak latency of the a_1-wave. (3) The mean value in the latencies of the first spikes in the ganglion cell discharge was 11.1 ± 1.48 msec. and it was 3.1 ± 1.38 msec. longer than the peak latency of the a_1-wave. And (4) the mean value in the latencies of the optic nerve response was 11.6 ± 0.47 msec. and it was 3.7 ± 0.23 msec. longer than the peak latency of the a_1-wave.

A68-80027
EFFECTS OF PHYSICAL TRAINING ON TOLERANCE TO COLD IN RATS.
S. B. Stromme and H. T. Hammel (Yale U., School of Med., Dept. of Physiol. and John B. Pierce Found. Lab., New Haven, Conn.).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 815–824. 47 refs.
Contract AF 33(615)-2825.

Four groups of ten rats were maintained for eight wk. under the following conditions: group N: neutral environment (26°C.), inactive; group NA: neutral environment active; group C: cold environment (5°C.), inactive; group CA: cold environment, active. The two active groups lived in activity cages and underwent treadmill exercise. Improved physical fitness was demonstrated by a significant resting bradycardia in relation to the untrained groups. Cold acclimation was shown by 47% higher resting metabolic rate in the cold-exposed groups than in the thermoneutral groups. Tested at 0°C. and −10°C.; the metabolic response of group NA was, respectively, 13 and 12% greater than that of group N. Group NA was also able to maintain higher skin temperature on the feet during cold exposure than group N. There was no effect of physical training upon the metabolic and thermal response to noradrenaline, suggesting that the enhanced capability to elevate the metabolic rate during cold stress in group NA was mainly due to an improved shivering capacity.

A68-80028
EVALUATION OF THYROID AND ADRENAL–PITUITARY FUNCTION DURING COLD ACCLIMATION.

J. A. Straw and M. J. Fregly (Fla. U., Coll. of Med., Dept. of Physiol., Gainesville).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 825–830. 20 refs.
Contract DA-49-193-MD-2549 and Grant NIAMD 1-F2-AM-21, 295-01.

Adrenal–pituitary and thyroid function were evaluated in rats exposed to about 6°C. for periods ranging from 2 to 52 days. Adrenal–pituitary function (evaluated by measuring blood levels of corticosterone after histamine stress) increased rapidly with time of cold exposure, reaching a maximum after 7–14 days, and then declined, reaching control levels after 28 days in the cold. Adrenal weights increased maximally after 14 days in the cold and required 52 days to return to control levels. Thyroid function was evaluated by measuring plasma protein bound iodine (PBI), thyroid weight, rates of uptake and release of ^{131}I, oxygen consumption, and heart rates. When measured after 28 days in the cold, all criteria of thyroid function, except PBI, were indicative of increased activity.

A68-80029
VENTILATORY RESPONSE TO INFUSION OF H^+ IN NEWBORN AND ADULT DOGS.
Bruce D. Ackerman and Paul M. Taylor (Pittsburgh U., Med. School, Dept. of Pediat. and Magee-Womens Hosp., Alan Magee Scaife Labs., Pittsburgh, Pa.).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 917–922. 12 refs.
Grants PHS RO1 HD 01395-01, PHS TI HD 62, and PHS K3-HD-18,321.

The ventilatory response of unanesthetized adult and newborn (24- to 120-hr. old) dogs to metabolic acidosis was compared. Hydrochloric acid, 0.125 N, was infused at mean rates of 0.8 ml./kg. min. for adults and 0.5 ml./kg. per min. for pups so that their rates of increase of arterial $[H^+]$ were similar. All dogs hyperventilated as $[H^+]a$ rose. The mean ventilatory response to metabolic acidosis, as indicated by $\Delta\dot{V}/\Delta[H^+]a$ (% increase/(moles $\times 10^{-9}$/liter)), was 2.66 (range 1.57–4.15) for adult dogs and 0.98 (range 0.55–1.27) for pups. Arterial carbon-dioxide tension decreased more for adult dogs than for pups during HCl infusion. The quantitative difference in the ventilatory responses of adult and newborn dogs to metabolic acidosis may indicate (a) decreased sensitivity of the respiratory center to $[H^+]a$ for pups than for adult dogs, (b) greater dependence on CO_2 stimulation of respiration for pups than for adult dogs, or (c) limitation of the pups' response by decreased compliance or by muscular weakness.

A68-80030
ANALYSIS OF THE RELATION OF PULMONARY ARTERIAL OR AIRWAY CONDUCTANCE TO LUNG VOLUME.
Thomas C. Lloyd, Jr. (Western Reserve U., School of Med., Dept. of Physiol., Cleveland, Ohio).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 887–894. 19 refs.
Heart Assn., Ohio supported research.

A mathematical model was developed for the relation of lung volume to airway and blood vessel conductances based on assumptions of linear relationships between the following pairs of entities: fluid driving pressure and flow; radial longitudinal conduit strains; lung linear dimensions and conduit length; logarithm of lung volume and of linear lung dimensions. When the only variable was the quotient of radial to longitudinal strain, the model predicted that conductance-volume plots of such a linearized system could have multiple shapes with positive, negative, or zero slopes. Experiments validated the assumed relation between lung volume and lung dimensions, and support for other assumptions was cited. Observations of the pulmonary arterial pressure gradient were made as lobes were progressively inflated in a perfusion system where interfacial and gravitational effects were eliminated. The multiple relationships predicted by the model were found. It was concluded that explanations of the behavior of airways and blood vessels based on "unkinking," capillary compression, decrease in vascular volume, or alteration of flow profiles may be unwarranted.

A68-80031
DIURNAL VARIATIONS IN URINARY–ALVEOLAR N_2 DIFFERENCE VENOUS ADH EFFECTS OF RECUMBENCY.
John D. Abernethy, Jerome J. Maurizi, and Leon E. Farhi (N. Y. State U., Depts. of Physiol. and Med., Buffalo).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 875–879. 14 refs.
Grant PHS HE-0-8852 and USAF supported research.

The diurnal variations in urinary–alveolar nitrogen difference $(u-A)DN_2$ were examined in 44 samples obtained in one subject over a period of several weeks. This difference was high in the night samples and significantly lower during the day. These results are best explained by an increased inhomogeneity of ventilation–perfusion ratio distribution during the night. This was tested by assessing the effects of recumbency, which was found to cause a significant increase in $(u-A)DN_2$.

A68-80032
EFFECT OF $+G_Z$ AND $+G_X$ ACCELERATION ON PERIPHERAL VENOUS ADH LEVELS IN HUMANS.
James D. Rogge, Ward W. Moore, William E. Segar, and A. F. Fasola (School of Aerospace Med., Brooks AFB, Tex. and Ind. U., Med. Center, Depts. of Physiol. and Pediat. and Lilly Lab. for Clin. Res., Indianapolis).
Journal of Applied Physiology, vol. 23, Dec. 1967, p. 870–874. 34 refs.
Grants PHS HE-10401 and PHS H-6308.

The effect of $+2$ g_z and $+2$ g_x acceleration for 30 min. on the peripheral venous ADH levels in human subjects was studied on the United States Air Force-SAM human centrifuge. A mean rise in the blood ADH level of 2.97 μU/ml. ($P<0.05$) was found during the $+g_z$ runs, and this rise could be inhibited by having the subjects wear an anti-g suit inflated to 60 mm. Hg. A mean decrease in the blood ADH level of 0.89 μU/ml. ($P<0.05$) was found during g_x acceleration. These results support the assumptions of previous authors that changes in urine volume during $+g_z$ and $+g_x$ acceleration are probably a result of changes in ADH secretion.

A68-80033
THE EFFECTS OF AMBIENT NOISE UPON SIGNAL DETECTION.
Angelo Mirabella and Donald A. Goldstein (Gen. Dyn., Elec. Boat Div., Groton, Conn.)
Human Factors, vol. 9, Jun. 1967, p. 277–284. 31 refs.
Contract NOnr 2512(00).

One aspect of the sensory interaction phenomenon was reviewed, the effect of ambient noise upon signal detection performance. An objective of this review was to arrive at possible generalizations about the effects of noise through an examination of variables affecting both similarities and divergencies of results. A second objective was to discuss some of the limitations of noise research for theory and practice, using sonar surveillance in undersea warfare as a reference operation. The conclusions from the review were organized under two major headings: (1) effects of noise for the alerted operator case involving threshold sensitivity; and (2) effects of noise for the unalerted operator case involving vigilance behavior. The limitations of the literature for theory and practice were also discussed under these major headings.

A68-80035
THE EFFECT OF VISUAL DEPRIVATION ON CORTICAL NEURONS: A GOLGI STUDY.
Albert Globus and Arnold B. Scheibel (Calif. U., School of Med., Dept. of Anat. and Brain Res. Inst., Los Angeles).
Experimental Neurology, vol. 19, Nov. 1967, p. 331–345. 35 refs.
Grant PHS HD-00972.

The effects of visual deprivation on the structure of visual cortex during the first 30 days of life were studied in 25 young rabbits and compared with an equal number reared under normal conditions. Rapid Golgi and Golgi–Cox techniques were used to examine the results on the total number of cortical neurons, the relative proportion of various cell types, length and branching patterns of dendrites in pyramids and stellate cells, and the appearance and density of spines along dendrites of pyramids. Results of the study indicated no difference in total neuronal numbers or in the frequency of various cell types and no significant variation in pyramidal cell dendritic systems. Stellate neurons throughout visual cortex and particularly in layer IV showed a greater range of variation in densritic length among experimental animals than among controls. It was suggested that this might reflect the importance of specific afferent stimulation during the postnatal period as a controlling factor, working jointly with genetic restraints in determining value ranges for various neural parameters such as dendrite length. In the case of our experimental animals, one of these two controlling elements would presumably have been withdrawn, leading to a wider range of values. Deformity of spines along the central three-fifths of the apical shafts of visual pyramids appeared to constitute the major structural change resulting directly from loss of visual stimuli. Although total numbers were apparently not reduced, a number of definable changes in the structure of spines was noticed under oil immersion optics. The most significant of these appeared to be variability of, or loss of the terminal enlargement which characteristically caps dendritic spines. The changes in spine morphology representing the response of visual cortex to complete lack of visual stimulation underline the sensitivity of immature cortex to the external milieu.

A68-80036
ACTIVITY OF BULBAR RESPIRATORY NEURONS DURING PASSIVE HYPERVENTILATION.
H. L. Batsel (Calif. U., School of Med., Los Angeles and Veterans Admin. Hosp., Med. Res. Programs, Long Beach).
Experimental Neurology, vol. 19, Nov. 1967, p. 357–374. 28 refs.

Discharge of bulbar respiratory neurons was recorded extracellularly with tungsten microelectrodes in pentobarbitalized, in urethanized, and in unanesthetized decerebrate cats. Neuronal discharges were followed while the animals were hyperventilated to apnea. Most inspiratory neurons were inactivated, with late neurons first affected. Some early units continued to exhibit a respiratory rhythm for a few seconds after apnea was induced. An estimated quarter of all inspiratory neurons went progressively into tonic discharge which could not be arrested by further overventilation. The majority of respiratory neurons was sent into slow tonic discharge which continued into posthyperventilation apnea. This residual tonic discharge could not be arrested by additional overventilation. Prior to hyperventilation, most of these neurons began firing in the early expiratory phase. The remaining expiratory neurons, predominantly late units, were progressively inactivated by hyperventilation. Results suggest that in this type of apnea the residual tonic discharge exists simultaneously in inspiratory and expiratory neuron populations. In recovery from apnea, some members of both inspiratory and expiratory neuron populations began to discharge rhythmically a few cycles before any discernible inspiration.

A68-80037
EXPERIMENTAL Q-SWITCHED RUBY LASER RETINAL DAMAGE.
H. C. Zweng, R. C. Rosan, R. M. Shuman (Stanford U., School of Med., Palo Alto, Calif.), R. R. Peabody (Stanford Med. Center, Palo Alto, Calif.), A. Vassiliadis, and R. C. Honey (Stanford Res. Inst., Menlo Park, Calif.)
Archives of Ophthalmology, vol. 78, Nov. 1967, p. 634–640. 6 refs.
Grant NINDB 1RO-INB 06341.

Using a Q-switched ruby laser with an 8-nanosecond pulse width, it was found that an exposure of 8 μJ to the retinas of pigmented rabbits and 22 μJ to the paramacular area of rhesus monkey retinas was sufficient to give a 50% probability of producing a clinically observable lesion. This corresponds to approximately 0.1 J/sq. cm. retinal energy density for the rabbits and 0.8 J/sq. cm. for the rhesus monkey. From the data obtained there is strong evidence that the retinal energy density or retinal power density is the determining factor in threshold damage estimates. In rabbits, but not in monkeys, there was ophthalmoscopic and pathologic evidence of hemorrhage in some lesions made at energy levels as low as three times above threshold. The failure of repair mechanisms to occur in retinal tissue up to one mo. after injury and the observations of local hyperplasia in response to the Q-switched beam are of considerable interest. The great difference in threshold levels between the two species studied, rabbits and monkeys, suggest that great care must be exercised in extrapolation to any other species, eg., human beings.

A68-80038
CHANGES IN THE ANTEROPOSTERIOR DIMENSIONS OF THE HUMAN MALE SKULL DURING THE THIRD AND FOURTH DECADE OF LIFE.
George S. Kendrick and Hubert L. Risinger (Baylor U., Coll. of Dentistry, Dept. of Microscop. Anat., Dallas, Tex.)
Anatomical Record, vol. 159, Sep. 1967, p. 77–82. 20 refs.
Tex., Med. Res. Found. supported research.

A cephalometric radiographic appraisal of the anteroposterior skull growth which occurs during a one-year interval was made on 71 caucasoid males at the Baylor University College of Dentistry, Dallas, Texas. The subjects were from 22–34 years of age. The dimensions assessed were the anterior cranial depth, the posterior cranial depth, upper facial depth, middle facial depth and lower facial depth. A significant increase was shown to occur in all the dimensions over a period of one year except that of the lower facial depth. It was concluded that skull growth does occur in male adults after the age generally accepted as that of maturity.

A68-80039
WEIGHTS AND VARIABILITY OF COMPONENTS OF THE HUMAN VERTEBRAL COLUMN.
E. W. Lowrance and Homer B. Latimer (Mo. U., Depts. of Anat., Columbia and Kan. U., Lawrence).
Anatomical Record, vol. 159, Sep. 1967, p. 83–88. 17 refs.

Principal vertebral segments and individual vertebrae of 83 Asian skeletons were weighed and the data treated statistically. Average weight in grams per unit vertebra in the cervical segment was 6.3, in the thoracic, 8.7, in the lumbar, 17.9 and in the sacrum, 10.6. Mean weights of segments of this series were the lightest of the populations compared except those of the American White and Japanese females. Individual vertebral weights increased in caudad sequence except that the first two cervical and first two thoracic were respectively heavier than the third cervical and third thoracic. Mean weights of the twelfth thoracic, fifth lumbar and the sacrum were approximate multiples of that of the seventh cervical. The third cervical was the lightest in the column. The cervical segment represented 15% of the weight of the entire column, and thoracic segment 36%, lumbar 31%, sacral 18% and coccygeal 0.4%. Relative weights of individual vertebrae corresponded closely with those of other populations compared. Coefficients of variation

ranged from 16% in the cervical segment, 19% in the thoracic, 17% in the lumbar, 18% in the scaral to 48% in the coccygeal. Variation was least in the second cervical and greatest in the third thoracic vertebra.

A68-80040
THE EFFECTS OF DIVIDED ATTENTION ON VISUAL MONITORING OF MULTI-CHANNEL DISPLAYS.
John D. Gould and Amy Schaffer (IBM Res. Center, Yorktown Heights, N. Y.)
Human Factors, vol. 9, Jun. 1967, p. 191–202. 22 refs.

The effects of divided attention on monitoring multi-channel alphameric displays for signals defined on the basis of the simultaneous values of all channels, i.e., multi-channel signals as opposed to single-channel signals, were investigated. Variables investigated included: (a) three methods of dividing attention (a short writing task, a long writing task and blanking out the display); (b) number of channels monitored (4, 8, 12, and 16); (c) rate of display change (6 or 12 times/min.); (d) number of different signals simultaneously watched for (8 or 24); and (e) number of levels within channels (2 or 8). The main results were: (a) divided attention did not lead to a decrease in monitoring, compared to a control study without divided attention; (b) the rate of display change had the greatest effect upon performance, followed by the number of channels monitored; (c) even at the faster rate of display change, untrained subjects detected 80% or more of the signals when they monitored up to 12 channels; and (d) different methods used to divide attention affect performance differentially.

A68-80041
HUMAN PERFORMANCE IN THE COLD.
William F. Fox (George Washington U., Human Resources Res. Office, Washington, D. C.)
Human Factors, vol. 9, Jun. 1967, p. 203–220. 68 refs.
Contract DA 44-188-ARO-2.

The literature dealing with human performance in the cold is reviewed. Seven major areas are discussed: (a) tactile sensitivity; (b) manual performance; (c) tracking; (d) reaction time; (e) complex behaviors; (f) maintaining hand skin temperature (HST) as a means of maintaining operator effectiveness; and (g) adaptation and acclimatization to low ambient temperatures. Performance decrements at low ambient temperatures appear to result principally from lowered HST and competing stimuli provided by the cold environment.

A68-80043
THE EFFECT OF CONFLICTING INSTRUCTIONS AND FEEDBACK SPECIFICITY ON TACTICAL DECISION PERFORMANCE.
Robert G. Kinkade and Maurice P. Ranc (A.A.I. Corp., Cockeysville, Md.)
Human Factors, vol. 9, Jun. 1967, p. 257–262.
Contract AF 19(628)-4792.

The effect of the specificity of feedback on the quality of decision performance when the decision maker's initial instructions are incorrect was investigated. A relatively simple tactical decision task was used in which one of three decision alternatives was selected and the probability for success (P_s) was estimated from information that was supplied. It was shown that P_s feedback appeared to have little effect on performance when incorrect instructions were given, but it produced superior performance when correct instructions were given. The view that a decision maker attempts to refine his concept concerning the relationships between his information about the environment and the available decision alternatives on the basis of his feedback was supported.

A68-80044
SUBJECTIVE PROBABILITIES INFERRED FROM ESTIMATES AND BETS.
Lee Roy Beach (Wash. U., Seattle) and Lawrence D. Phillips (Mich. U., Ann Arbor).
Journal of Experimental Psychology, vol. 75, Nov. 1967, p. 354–359. 9 refs.
Contract AF 49(638)-1731 and Grant NIMH MF-12,744-01.

The similarity among veridical event probabilities, subjective probabilities inferred from subjects' estimates of the event probabilities, and subjective probabilities inferred from choices among bets involving the same events was examined. In one condition, subjective probabilities were based on two levels (high and low) of experience with the relative frequencies of the event occurrences. The similarity between the two kinds of inferred subjective probabilities and the veridical probabilities increased with experience and, as would be expected if both estimates and bets were based on the same underlying subjective probabilities, the two sets of inferred subjective probabilities were equally similar to each other ($r = .93$) at both experience levels. In a second condition, event probabilities were displayed and subjects used them to make choices among bets; the inferred subjective probabilities were highly correlated with the displayed values ($r = .96$). It was possible to account for at least some of the response error variance by individual differences in test anxiety.

A68-80045
VISUAL BEAT PHENOMENA AS AN INDEX TO THE TEMPORAL CHARACTERISTICS OF PERCEPTION.
Rathe Karrer.
Journal of Experimental Psychology, vol. 75, Nov. 1967, p. 372–378. 16 refs.

Visual beats, produced by the combination of intermittent light pulses in both binocular and dichoptic vision, gave evidence of temporal resolution. The perceived beat rate indicates that the "photopic" and "scotopic" visual systems follow flicker frequency accurately up to CFF; above fusion no beats are perceived. Beats occur between different vestigial flicker frequencies disputing the concept of a constant rate of phenomenal flicker and neural firing just prior to fusion. The temporal resolution of the visual system can adapt to the temporal conditions of stimulation to an extent not previously indicated by two-pulse and short-train studies.

A68-80046
EFFECTS OF POSTRESPONSE STIMULUS DURATION UPON SHORT-TERM MEMORY.
Norman R. Ellis and Terry R. Anders (Ala. U., University).
Journal of Experimental Psychology, vol. 75, Nov. 1967, p. 418–424. 9 refs.
Grant NIMH MH 10724.

Three experiments assessed the effects of postresponse stimulus duration (PSD) in a two-choice concurrent short-term memory task. Subjects, college students, responded to one of a pair of stimuli (geometric designs) on a training trial and after varying numbers (0, 1, 2, 3, 4) of intervening trials (which were also training or test trials) received a test trial. In a first study, subjects received PSDs of 0, 1, 2 and 3 sec. A second, varied PSD (0, 1.5, and 3 sec.) and intertrial interval (ITI) (0, 3, 6, and 9 sec.), and a third, contrasted a correction and noncorrection procedure with a 0-sec. PSD. PSD, ITI, and number of interpolated items substantially affected performance with each of the PSD and ITI groups separating reliably. Performance decayed systematically with increased number of interpolated items. No significant interaction obtained between PSD and ITI. The correction and noncorrection groups did not differ significantly.

A68-80047
ASSESSMENT OF VESTIBULAR SENSITIVITY.
Walter H. Johnson, J. Brydon Smith, and Joseph A. Sullivan (Toronto U., and St. Michael's Hosp., Depts. of Otolaryngol., Canada).
(Am. Otol. Soc., 100 Ann. Meeting, Quebec, Canada, May 17–18, 1967).
Annals of Otology, Rhinology and Laryngology, vol. 76, Aug. 1967, p. 709–715. 5 refs.
Atkinson Charitable Found. supported research.

The design and uses of an electronic computer for testing vestibular sensitivity is described. It allows a fast quantitative evaluation of sensitivity by giving a digital and analog display of eye movements. These may be of otolith or semicircular canal origin. Clinical tests or experimental work can be carried out on animals or humans. It is hoped that this method will better diagnose defects in equilibrium.

A68-80048
THE RESPIRATORY EFFECTS OF CARBON DIOXIDE IN THE CAT.
Lawrence W. Raymond (Naval Med. Res. Inst., Physiol. Sci. Dept., Bethesda, Md.) and Frank G. Standaert (Georgetown U., School of Med., Dept. of Pharmacol., Washington, D. C.)
Anesthesiology, vol. 28, Nov.–Dec. 1967, p. 974–980. 31 refs.
Grants PHS 2TI GM-99 and PHS GM-K3-15,517.

Although concentrations of CO_2 greater than ten% have been characterized as depressant to respiration, in the experiments reported here concentrations from 5 to 40% stimulated respiratory minute volume ($\dot{V}_E$) in the anesthetized and in the decerebrate cat. The stimulatory effect was maintained for at least four hours. Sixty % CO_2 depressed ventilation in some cats, but stimulated it in others. The mean $\dot{V}_E$ at this concentration was one-half of the control value. Unanesthetized cats showed a greater respiratory response to CO_2 than barbiturate-anesthetized or decerebrate animals, and $\dot{V}_E$ was not depressed by 60% CO_2 in any of these animals. Recordings of phrenic nerve electrical activity disclosed central respiratory stimulation in all animals by all concentrations of CO_2.

A68-80049
ENHANCED STIMULANT EFFECT OF D-AMPHETAMINE ON THE SPONTANEOUS LOCOMOTOR ACTIVITY OF RATS TREATED WITH RESERPINE.
J. M. Stolk and R. H. Rech (Dartmouth Med. School, Dept. of Pharmacol. and Toxicol., Hanover, N. H.)
Journal of Pharmacology and Experimental Therapeutics, vol. 158, Oct. 1967, p. 140–149. 33 refs.
Grant PHS NB 06013 and PHS I-TI-GM 1370-01.

The effect of d-amphetamine in stimulating locomotor activity was measured in rats with and without reserpine pretreatment. As previously reported in mice, amphetamine caused greater stimulation of locomotor activity in animals that had received reserpine. However, dose-response curves in these rats are distinctly different from those derived from animals that did not receive reserpine. At all time periods of testing following the administration of reserpine (4, 13 and 25 hr.) animals scored less than or the same as controls in their peak activity response to 0.25 to 1 mg./kg. of amphetamine. On the other hand, a dose of 2.0 mg./kg. of amphetamine induced a greater peak activity count in reserpine-pretreated rats than in controls. The latency to peak drug effect in reserpine-treated subjects, especially after the 4- and 13-hr. pretreatments, was one-half that observed in the control rats. These results indicate that the reactivity of d-amphetamine in the brain is modified at all three time periods after the administration of reserpine. The duration of the stimulant action of d-amphetamine was markedly shortened in rats treated 4 or 13 hr.

A68-80050
ATTENTION IN THE IDENTIFICATION OF STIMULI IN COMPLEX VISUAL DISPLAYS.
Joseph S. Lappin.
Journal of Experimental Psychology, vol. 75, Nov. 1967, p. 321–328. 18 refs.
Grant PHS MH-1206.

The identification of three stimuli embedded in brief foveal displays was studied under conditions varying the relationship between the relevant stimuli; the stimulus displays and responses were the same in all conditions. Performance was best when the stimuli were the three dimensions of a single object, and better when they were the same dimension than when a different dimension of each of three objects. In the multiple-object conditions, accuracy was correlated with serial order of the responses. However, the three responses to each display were independently accurate within all conditions. It was suggested that the "span of attention" is not fixed. In a supplementary experiment, the spatial separation of the relevant stimuli was found to have no effect.

A68-80051
THE DETERMINATION OF OXYGEN DISSOCIATION CURVES OF HIGHLY DILUTED HEMOGLOBIN SOLUTIONS [DIE BESTIMMUNG DER SAUERSTOFFBINDUNGSKURVE VON HOCHVERDUNNTEN HAMOGLOBINLOSUNGEN].
Jürgen Grote (Mainz U., Physiol. Inst., West Germany).
Pflügers Archiv für die gesamte Physiologie, vol. 296, Sep. 1, 1967, p. 202–211. 32 refs. In German.

Oxygen dissociation curves of diluted hemoglobin solutions are plotted with the aid of a test procedure outlined previously by another worker for the examination of O_2 diffusion in biological media. The applicability of this process for the direct and exact determination of oxygen dissociation curves is verified both theoretically and in practice. Tests on greatly diluted human hemoglobin solutions of concentration 16.4×10^{-3} g./100 ml. and 16.4×10^{-4} g./100 ml., give the following results: at temperatures of 20, 30, and 37°C. with a pH value of 8.0, the oxygen dissociation curves of the hemoglobin solutions tested display typical slopes. The oxygen affinity of the test solutions increases with diminishing concentration.

A68-80052
METABOLIC REACTION AND HEAT LOSS IN HAIRLESS AND NORMAL MICE DURING SHORT-TERM ADAPTATION TO HEAT AND COLD.
B. Hošek and J. Chlumecký (Czech Acad. of Sci., Inst. of Biophys., Brno).
Pflügers Archiv für die gesamte Physiologie, vol. 296, Sep. 1, 1967, p. 248–255. 11 refs.

Heat production, heat loss, and internal temperature at (30, 90, and 150 min. intervals) after a sudden change in the external temperature from 23 to 36 and 15°C., respectively, were studied in normal and hairless mice. The course of the immediate adaptation reaction and the values after its dying away were compared. At 36°C., both the strains differed significantly in the initial reaction of the internal body temperature and the metabolism which was much more intensive in normal mice. At low temperatures, the differences between the two strains manifested themselves mainly in the overall level of energy exchange. The O_2 consumption at 15 and at 23°C. was more than 50% higher in hairless mice than in normal animals ($p<0.01$), the increase on O_2 consumption per 1°C. amounting in hairless mice to 0.533 and in normal mice to 0.210 [ml. $g.^{-1}$ $hr.^{-1}$]. The internal temperature at 23°C. was the same for both strains, but after 150 min. at 36°C., it reached the value of 37.9°C. in normal mice and only 37.2°C. ($p<0.05$) in hairless animals. At an external temperature of 15°C., the internal temperature of normal mice decreased to

36.5°C., while in hairless individuals it dropped to 35.6°C. ($p<0.05$). Heat loss due to radiation and conduction followed the changes in heat production with external temperature. Evaporative heat loss at 36°C. increased by about 100% in comparison with the values at 23°C. and it accounted for about 40% of the total heat loss for both strains of mice. In the cold, only 6 to 7% of the total loss was lost through evaporation.

A68-80053
A COMPUTER METHOD FOR STUDYING THE POSTEXERCISE BALLISTOCARDIOGRAM.

David H. Jackson and Efrain Molina (Naval Aerospace Med. Center, Naval Aerospace Med. Inst., Cardiol. Branch, Pensacola, Fla.)

American Heart Journal, vol. 74, Oct. 1967, p. 513–522. 7 refs.

The postexercise ballistocardiogram has been shown to be a useful diagnostic tool but it is limited by artifacts which result from muscle tremor and respiratory movement, especially if the exercise is vigorous. An electronic system, which incorporates a small digital computer used in a manner similar to an electronic system and used previously for clearing electrocardiographic records of artifact was applied in the recording of low-frequency ballistocardiograms obtained before and after standardized exercise. Evaluation of the quality and accuracy of reproduction of the post-exercise tracings shows that this system is feasible for use in a larger-scale postexercise ballistocardiographic study. This system also lacks the complexity of the one used with electrocardiograms. Any difficulties in reproduction were inherent in the ballistocardiographic apparatus, not in the system. Lines for further investigation are pointed out.

A68-80054
TELEMETRY ON MAN WITHOUT ATTACHED SENSORS.

William A. Shafer (Gen. Dyn., Convair Div., San Diego, Calif.)

(Med. Soc. of State of N. Y., 160th Ann. Meeting, New York City, Feb. 17, 1966).
New York State Journal of Medicine, vol. 67, Nov. 1, 1967, p. 2832–2837.

A new system of biomedical monitoring, still in the formative stages of development, shows promise as a clinical tool. Indications are that it will also be useful in evaluating cardiovascular functions under conditions of weightlessness and inactivity. Physically, the system consists of a pair of sensing antennas placed near the subject, isolation amplifiers, a main amplifier section, and recorders. In theory, the system uses distortion effects created within an electromagnetic field. Many potential uses for this technic have been found, including long-term monitoring without skin damage from electrodes, monitoring a sleeping unconscious subject, and monitoring animals.

A68-80055
AUDITORY DAMAGE THROUGH INDUSTRIAL NOISE [HORSCHADEN DURCH INDUSTRIELARM].

H. G. Dieroff (U.-Hals-Nasen-Ohrenklin., Jena, East Germany).

Arbeitsmedizin Sozialmedizin Arbeitshygiene, vol. 2, Jul. 1967, p. 256–260. 31 refs. In German.

The state of the knowledge of severe auditory damage caused by noise was reported. A description of the pathological-anatomical picture of auditory function damage caused by strong acoustic action in various occupations was presented, and the information from the literature was discussed. The question of sex differences in auditory damage was presented. The review concluded with a discussion on the problems of the critical intensity and the most accurate assessment of noise in a work area. For intermittent and palse-rich sound, long section measurements with a volume frequency counter was recommended. Impulse-rich noise in a work area produced a significant occurrence of auditory damage.

A68-80056
AIR PRESSURE DAMAGE OF THE EARS [DRUCKLUFTSCHADEN DES OHRES].

E. Lehnhardt (U.-Hals-Nasen-Ohrenklin, Hamburg-Eppendorf, West Germany).

Arbeitsmedizin Sozialmedizin Arbeitshygiene, vol. 2, Jul. 1967, p. 248–251. 35 refs. In German.

Auditory disorders from working in air pressure occurred predominantly in the inner ear or in the central nervous system. The disorders were restricted to the middle ear when during the compression, the tube function for ventilation of the tympanic cavity failed. Instantaneous re-exposure to high pressure conditions is essential for the treatment and prophylaxis of Caisson's disease. The trouble and symptoms followed a special pressure and time table during the exposure.

A68-80057
LOCAL AND REFLEX FACTORS AFFECTING THE DISTRIBUTION OF THE PERIPHERAL BLOOD FLOW DURING ARTERIAL HYPOXIA IN THE RABBIT.

J. P. Chalmers, P. I. Korner, and S. W. White (New South Wales U., School of Physiol., Sydney, Australia).

Journal of Physiology, vol. 192, Sep. 1967, p. 537–548. 34 refs.
Natl. Heart Found., Life Insurance Med. Res. Fund, and Australian Res. Grants Comm. supported research.

The effects of severe arterial hypoxia on the blood flow in the portal vein, and in kidney, muscle and skin beds were determined in normal unanesthetized rabbits, in animals without functioning autonomic effectors, and in rabbits with section of the carotid sinus and aortic nerves. The resting blood flows in the above regions were not significantly different in the three groups. The susceptibilities of the various beds to the local dilator effects of arterial hypoxia (assessed from the responses of animals without functioning autonomic effectors) were markedly different; vasodilatation was by far the greatest in the portal bed, followed in order by the renal, skin and muscle beds. Section of the carotid sinus and aortic nerves completely abolished reflex activity, and the pattern of peripheral blood flow changes was similar to that of animals without functioning autonomic effectors. The findings suggest that the arterial chemoreceptors are the primary afferent source of reflex control of the peripheral circulation in arterial hypoxia. In normal animals with intact reflexes there was sustained vasoconstriction throughout the treatment period in the portal and renal bed. The net vasomotor effects in muscle and limb skin were small owing to the operation of a number of factors, which opposed the effects of reflexly increased sympathetic nerve activity.

A68-80058
QUANTITATIVE ASPECTS OF FREE FATTY ACID METABOLISM IN THE FASTED RAT.

Nome Baker and Michael C. Schotz (Calif. U., School of Med., Dept. of Biol. Chem. and Veterans Admin. Center, Radioisotope Res., Los Angeles).

Journal of Lipid Research, vol. 8, Nov. 1967, p. 646–660. 36 refs.
Grants NIH FR-3 and NIH AM 4706.

Palmitate-1-^{14}C was injected intravenously into unanesthetized, fasted rats. Disappearance of tracer from plasma free fatty acids was studied. A large component of free fatty acid (FFA) recycling was directly demonstrated by reinjection experiments. The latter studies also indicated the existence of an unidentified, rapidly turning over polar lipid in plasma which was synthesized from palmitate-^{14}C. The appearance of ^{14}C in hepatic and extrahepatic triglycerides, in other esters, and in respired CO_2 was also followed. The data were analyzed using a multicompartmental model and a digital computer. Only a small fraction of the triglycerides formed in liver was derived directly from plasma free

fatty acids. The major portion of net triglyceride formation appeared to be by way of an intermediate nontriglyceride ester pool which turned over relatively slowly compared to plasma free fatty acids. Initial approximations are as follows (μ moles of fatty acid/min./100 g. body weight): net free fatty acid mobilization (irreversible disposal) = 2.4; hepatic triglyceride formation directly from plasma free fatty acid = 0.1; total hepatic lipid formation from plasma free fatty acids = 0.5; oxidation of free fatty acids to CO_2 = 0.8; percentage of respired CO_2 from direct oxidation of fatty acids = 12%; extrahepatic triglyceride formation directly from fatty acids = 0.4; total extrahepatic lipid formed directly from fatty acids = 1.2.

A68-80059

CENTRAL READING AND MUTUAL INHIBITION FROM SIGNALS IN THE FUNCTIONAL VISUAL FIELD [CENTRAAL AFLEZEN EN WEDERZIJDSE INHIBITIE VAN SIGNALEN IN HET FUNKTIONEEL GEZICHTSVELD].

A. F. Sanders (Inst. voor Zintuigfysiol. RVO-TNO, Soesterberg, The Netherlands).

Psychologie, vol. 22, Apr. 1967, p. 251–262. 6 refs. In Dutch.

Some experiments on peripheral discrimination of arrow directions were described. A horizontal row of six arrows was presented at each trial and subjects fixated the extreme left arrow during the 0.1 sec. presentation period. Report was given about one arrow only, which was either verbally instructed before presentation or visually indicated during presentation or by both means. The results showed evidence for a peripheral mutual inhibition mechanism of adjacent visual material which was accordingly most active at the center arrows and less at the extreme. Secondly, there seemed to be a selectively operating central reading process, which confused positions of the central but not of the outer arrows. So, both mechanisms had a similar effect in the case of verbal instruction, which explained the considerable serial order effect in that condition. When visual indication was added, the peripheral inhibition was increased at all arrows, while the confusion of the reading process was diminished. This explained the improvement of discrimination at the center arrows and the impairment at the extreme one in that condition.

A68-80060

A NOMOGRAM FOR O_2 DEPENDENCE OF THE ACID-BASE STATUS IN HUMAN BLOOD [EIN NOMOGRAMM FUR DIE O_2-ABHANGIGKEIT DES SAURE-BASEN-STATUS IM MENSCHLICHEN BLUT].

G. Thews (Mainz U., Physiol. Inst., West Germany).

Pflügers Archiv für die gesamte Physiologie, vol. 296, Sep. 1, 1967, p. 212–221. 9 refs. In German.

A new nomogram for human blood is presented, which plainly depicts the dependence of the total acid-base status on the degree of oxygenation of the hemoglobin. When O_2 tension, CO_2 tension, pH_8 value and Hb concentration are known, the nomogram is of particular use in giving the following values without special calculation: O_2 saturation, actual bicarbonate, total CO_2, base excess, base excess for complete oxygenation, buffer base, standard bicarbonate and standard pH_8. The method of using the acid-base nomogram, together with its application potential, are explained.

A68-80061

EFFECT OF CHRONIC EXERCISE ON MYOCARDIAL FUNCTION.

James Crews and Earl E. Aldinger (USPHS Hosp., Seamen's Mem. Res. Lab. and Tulane School of Med., Dept. of Med., New Orleans, La.)

American Heart Journal, vol. 74, Oct. 1967, p. 536–542. 27 refs.
Grant NHI H6769.

The contractile state of the intact normal and hypertrophied rat heart was investigated by measuring isometric systolic tension with a strain-gauge lever system. The myocardial tension that developed at any given end-diastolic tension is an indication of potential contractility. Cardiac hypertrophy (33%) was produced by subjecting albino female rats to swimming for from 118 to 250 hr. The exercised heart was capable of developing significantly more tension than the normal heart at end-diastolic tensions of 10, 20, and 30 gm., and the myocardial changes associated with exercise resulted in an increased ability to perform mechanical work. The development of hypertrophy concomitant with chronic exercise may represent a fundamental adaptive mechanism that is associated with long periods of increased cardiac output which acts as a compensatory measure for a tendency toward ischemia. This adaptive mechanism seems to be beneficial since no evidence was found to support the concept that hypertrophy may produce detrimental consequences. Rather, it is concluded that the degree of cardiomegaly produced in this study is advantageous in the maintenance of homeostasis during exercise. When a large volume or pressure demand is placed on the hypertrophied heart, it is actually capable of responding with a more pronounced Starling effect than the normal nonhypertrophied heart.

A68-80062

COPIOUS DRINKING AND SIMULTANEOUS INHIBITION OF URINE FLOW ELICITED BY BETA-ADRENERGIC STIMULATION AND CONTRARY EFFECT OF ALPHA-ADRENERGIC STIMULATION.

David Lehr, Jane Mallow, and Marilyn Krukowski (N. Y. Med. Coll., Flower and Fifth Ave. Hosps., Dept. of Pharmacol., New York City).

Journal of Pharmacology and Experimental Therapeutics, vol. 158, Oct. 1967, p. 150–163. 16 refs.
Grant NIH HE-00890-16.

In the albino rat, the s.c. injection of the beta-adrenergic agonist, isoproterenol, invariably elicited copious drinking which was not accompanied by an anticipated increase in urine volume. Prior water loading did not abolish this drinking and uncovered marked simultaneous inhibition of the urinary flow. In contrast, rats injected with the alpha-adrenergic stimulant, metaraminol, exhibited an increased urinary flow in the absence of conspicuous attempts by the animals to recoup the water loss by drinking. Pretreatment with the beta-adrenergic antagonist, propranolol, blocked the isoproterenol-induced drinking and inhibition of urine flow, whereas alpha-adrenergic blockade with tolazoline elicited isoproterenol-like effects due to beta adrenergic preponderance. A clear-cut dose-response relationship was demonstrated to exist for the effects of both isoproterenol and propranolol. The incisive effects upon the thirst drive elicited by the peripheral administration of adrenergic agonists and antagonists are considered evidence for central nervous system involvement. Specifically, these findings and the concomitant occurrence of reciprocal inhibition or increase in urinary flow are believed to be consistent with the concept of direct or reflex activation of central mechanisms of body water regulation.

A68-80063

INTEGRATED PHRENIC ACTIVITY IN HYPERCAPNIA AND HYPOXIA.

Adriana Garcia and Neil S. Cherniack (Ill. U., Dept. of Med., Chicago).

Anesthesiology, vol. 28, Nov.–Dec. 1967, p. 1029–1035. 12 refs.
Grants PHS 5-K3-HE 17-792 and PHS HE-09617; Tuberc. Inst. supported research.

Phrenic nerve electrical activity was recorded and integrated in 14 dogs during hypercapnia without hypoxia and during hypoxia without hypercapnia. The dogs were anesthetized with intravenous

pentobarbital or chloralose. In dogs anesthetized with either agent, hypercapnia primarily augmented the electrical activity of each phrenic nerve burst while hypoxia increased burst frequency more than integrated phrenic nerve burst activity. Heart rate slowed during both hypoxia and hypercapnia. There was small rise in systemic blood pressure with hypoxia but not with hypercapnia. When both arterial carbon dioxide and oxygen tension were kept constant, large, but not small, increases in systemic blood pressure decreased burst electrical activity. Hypoxia and hypercapnia may act on different subunits of the respiratory center.

A68-80064
EFFECTS OF FORMAL INTERITEM SIMILARITY AND LENGTH OF RETENTION INTERVAL ON PROACTIVE INHIBITION OF SHORT-TERM MEMORY.

John H. Wright (Va. Polytech. Inst., Blacksburg).

Journal of Experimental Psychology, vol. 75, Nov. 1967, p. 386–395. 10 refs.

Twenty subjects were randomly assigned to each of the 12 experimental conditions defined by the individual testing for short-term memory (STM) of six CCC trigrams sharing zero, one, two, or three consonants under a three-sec., nine sec., or eighteen sec. retention interval. Increasing the length of retention inteval reduced the likelihood of recalling the consonants of a trigram and also increased STM recall latency. Increasing the similarity of prior test items reduced the likelihood of recalling the consonants of a trigram in their correct trigram-letter positions. Prior-item intrusions at STM recall were an increasing function of interitem similarity but were unrelated to the length of retention interval. These findings suggested that interitem similarity was detrimental to the storage of a later item for STM through a process of interitem associative interference and that the increasing length of retention interval provided increasing time for forgetting via memory-trace decay.

A68-80065
PERCEIVED SHAPE AND ITS DEPENDENCY ON PERCEIVED SLANT.

Peter K. Kaiser (Calif. U., Los Angeles).

Journal of Experimental Psychology, vol. 75, Nov. 1967, p. 345–353. 13 refs.
Grant PHS NB-05185; Calif. U. supported research.

Koffka's suggestions that perceived shape and perceived slant "will be coupled together so that if one changes, the other changes also" and that errors in perceived shape vary as some function of errors in perceived slant were examined. Subjects described, by means of appropriate response mechanisms, the shapes and slants of trapezoids. Shape and slant responses were made both monocularly and binocularly. The changes in reported shape varied as a function of changes in reported slant. Also, shape response errors varied as a function of slant response errors under monocular viewing when subjects had no prior binocular experience with the trapezoid. The functions relating perceived shape to perceived slant were comparable to the function predicted by the Beck and Gibson shape–slant invariance hypothesis.

A68-80067
HUMAN ESTIMATES OF RANDOMLY PERTURBED FUNCTIONAL VALUES.

William A. Hillix, Ramon L. Hershman (U.S. Navy Electron. Lab., San Diego, Calif.), and Edgar L. Kapfer, Jr. (San Diego State Coll., Calif.)

Human Factors, vol. 9, Jun. 1967, p. 263–272. 19 refs.

The ability to estimate values of a function of two independent variables was studied. Numbers in a matrix were first estimated on the basis of past observations; then different subjects estimated the heights of rods which were to occupy positions in the same matrix. In each condition subjects were given feedback information which deviated from the true functional values because of "noise" or random error in the observations. The visual effect of the rods presentation enhanced estimation performance only at the highest noise levels and then only to a small degree. Subjects showed a decreasing but persistent ability to estimate, and this was linearly related to the standard deviation of the perturbing noise. The variance of subjects' guesses generally increased with the variance of the perturbed inputs. Subjects' behaviors were compared with that of a simple scanning and average-taking estimator.

A68-80068
THE EFFECTS OF DIFFERENTIAL VALUE ON THE RECALL OF REALISTIC TARGETS.

Richard E. Christ and Warren H. Teichner (Kan. State U., Dept. of Psychol., Manhattan and Northeastern U., Dept. of Psychol., Boston, Mass.)

Human Factors, vol. 9, Jun. 1967, p. 273–276.
Contract Nonr 3357(06).

The effects of differential value upon detection and recall were investigated using a multisymbol visual display. Three groups of 14 subjects each viewed slides containing experimentally vaired numbers of different realistic targets drawn from a population of nine possible targets. All subjects were instructed to maximize the value of their reports. One group was told that all targets were of equal value; for another group a different value was assigned to each of the nine targets; and for a third group, three different values were assigned to three sets of three targets each. The results suggested that performance may depend less on the differences in values assigned to targets than on the number and range of different values.

A68-80069
INACTIVATION AND TRAPPED RADICALS IN DRY TRYPSIN EXPOSED TO ULTRAVIOLET LIGHT.

H. B. Steen and T. Brustad (Norsk Hydro's Inst. for Cancer Res., Montebello, Norway).

(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 116–127. 19 refs.
Norweg. Cancer Soc. supported research.

The causal relationship between the trapped radicals and the inactivation of solid trypsin exposed to ultraviolet light (uv) has been investigated by measuring the concentration of radicals and the degree of inactivation as functions of exposure time and wavelength. The various wavelengths were obtained by irradiation with a polychromatic light source through optical filters which were opaque below different wavelengths. The number of trapped radicals per inactivated molecule varied from approximately 0.2 for wavelengths below 3,000 A, to 0.004 at 3,340 A. Between 3,130 and 3,340 A the electron spin resonance spectrum changed significantly. There is good agreement between the photon energy corresponding to this range of wavelength, and the dissociation energies of N–H and C–H bonds. The results make it unlikely that the inactivation is due entirely to the trapped free radicals. For uv light of wavelength below 3,000 A, however, a significant contribution to the inactivation due to the trapped radicals seems possible. For uv light of wavelength above 3,000 A, such a contribution must be very small.

A68-80070
EXCITATION, DISSIPATIVE, AND EMISSIVE MECHANISMS IN BIOCHEMICALS.

Leroy Augentein, Edward Yeargers (Mich. State U., Biophysics Dept., East Lansing), James Carter, and DeVaughn Nelson (Oak Ridge Natl. Lab., Health Physics Div., Tenn.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 128–138. 9 refs.
AEC supported research.

Fluorescence and phosphorescence from tryptophan powder at low temperatures has been stimulated with ultraviolet light (uv), vacuum uv, fast electrons, and X-rays. Radiationless conversions between higher excited singlet and triplet states and the ground state are efficient but temperature-insensitive. The data indicate that both optically forbidden and optically allowed transitions produced by fast and slow electrons are probably important in the light emitted as a result of x-irradiation.

A68-80071
ULTRAVIOLET-INDUCED EXCITED STATES IN DEOXYRIBONUCLEIC ACID.
Ronald O. Rahn, R. G. Shulman, and J. W. Longworth (Bell Telephone Labs., Inc., Murray Hill, N. J.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 139–146. 6 refs.

Previous investigations have shown that the phosphorescence from native DNA is not the sum of the emission from the individual nucleotides. Evidence is presented from electron spin resonance and optical emission studies that the triplet state of DNA and of poly dAT has properties similar to that of ionized thymidine. Because thymidine phosphoresces only on losing its N_3 proton (pH = 9.8), these results are consistent with an effective transfer of this proton in the hydrogen-bonded polynucleotides from thymine to adenine upon ultraviolet excitation.

A68-80072
MOLECULAR EVENTS RESULTING IN RADIATION INJURY, REPAIR AND SENSITIZATION OF DNA.
Waclaw Szybalski (Wis. U., McArdle Lab., Madison)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 147–159. 57 refs.
Grants NSF B-14976 and PHS CA-07175; Alexander and Margaret Stewart Trust Fund supported research.

A model which permitted a unification of all data pertaining to the lethal effects of X-rays on deoxyribonucleic acid (DNA), phages and cellular organisms was presented. It was found that: (1) DNA as a whole is the principle target of lethal radiation effects; (2) two distinct "targets" could be experimentally detected in the DNA molecule; (3) three different radiation mechanisms were distinguished; (4) the relative lethality of the three mechanisms were greatly dependent on the conditions of radiation; (5) the most common environments for intracellular DNA under oxygenated and anoxic conditions are given; and (6) only an indirect, oxygen-dependent reaction resulting in chemical modifications of nucleotides contributed to the radiosensitization phenomenon.

A68-80073
MUTATION-INDUCTION AND NUCLEAR INACTIVATION IN NEUROSPORA CRASSA USING RADIATIONS WITH DIFFERENT RATES OF ENERGY LOSS.
F. J. de Serres, B. B. Webber, and J. T. Lyman (Oak Ridge Natl. Lab., Biol. Div., Tenn. and Calif. U., Donner Lab., Berkeley).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 160–171. 17 refs.
AEC supported research.

A comparison of the effects of 250-kVp X-rays, 40-meV helium ions, and 108-MeV carbon ions on mutation induction and nuclear inactivation was made with a heterokaryon of *Neurospora crassa*. The relative biological effectiveness (RBE's) for mutation induction of two separate loci in the ad-3 region are 1.8 for helium ions and 5.0 for carbon ions. The RBE's for inactivation of the heterokaryotic conidia are 1.7 for helium ions and 5.3 for carbon ions. The relative efficiency of carbon ions for mutation induction is higher in *Neurospora* than in other organisms. This difference is attributed to the recovery of a class of mutations (extragenic alterations) which has not been studied with other test systems. Ad-3A ad-3B double mutants, which increase as the square of the dose with X-rays and helium ions, increase as the 1.45 power of the dose with carbon ions. This is interpreted as indicating that ad-3^{IR} mutations which are two-hit events with acute X-ray exposures are, in part, one-hit events with carbon–ion exposures.

A68-80074
INFLUENCE OF CO_2 INHALATION ON CEREBRAL RHEOLOGY (ATTEMPT TO MEASURE FROM AN INDEX OF CEREBRAL BLOOD FLOW USEABLE IN AN AERONAUTICAL MEDIUM) [INFLUENCE DE L'INHALATION DE CO_2 SUR LA RHEOGRAPHIE CEREBRALE (ESSAIS DE MESURE D'UN INDEX DE DEBIT SANGUIN CEREBRAL UTILISABLE EN MILIEU AERONAUTIQUE)].
Jean Demange and Gérard Demon (Centre d'Essais en Vol, Lab. of Aerospace Med., Brétigny-sur-Orge, France).
Revue de Médecine Aéronautique et Spatiale, vol. 6, 2nd Trimester, 1967, p. 5–9. 7 refs. In French.

A method of using two electrodes to measure cerebral blood flow is described. It is a relatively simple technique and applicable in studies of physiology of exercise. Measurements on flying personnel during longitudinal acceleration permitted studying impairement of cerebral circulation before getting greyout or blackout. Inhalation of CO_2 was used to study variations in blood flow and results are given.

A68-80075
RADIOBIOLOGICAL STUDIES WITH HEAVY PARTICLES AS RELATED TO THERAPY.
John H. Lawrence (Calif. U., Lawrence Radiation Lab. and Donner Lab. of Med. Physics, Berkeley).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 360–368. 48 refs.

Mammalian radiobiological studies of the interesting effects of heavy particles have been greatly extended since 1935 when investigations with cyclotron-produced fast neutrons showed that the very dense ionization produced by heavy ions (secondary protons) has a greater biological effect on both normal and neoplastic cells than that of X-rays or γ-rays. In addition to the greater relative biological effect, heavy particles have other therapeutically advantageous characteristics including less scatter, greater penetration, independence of oxygen concentration, lack of tissue recovery, and Bragg-peak effect. Since 1954 high-energy heavy-particle beams have been used to deliver large amounts of energy to relatively localized areas of the body, including the pituitary gland, brain and soft tissues, in the successful treatment of several metabolic, neoplastic, and neurologic diseases. Information concerning heavy-particle irradiation of man, although limited today to data on specific areas of the body, is helping us toward a better understanding of the hazards of space radiation, especially solar flares of heavy particles.

A68-80076
TIME-INTENSITY DATA IN SOLAR COSMIC-RAY EVENTS: BIOLOGICAL DATA RELEVANT TO THEIR EFFECTS IN MAN.
W. H. Sweet, R. N. Kjellberg, R. A. Field, A. M. Koehler, and W. M. Preston (Mass. Gen. Hosp., Boston).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 369–383. 12 refs.

The characteristics of the emission of heavy particles in the major solar cosmic-ray events of the last sunspot cycle are summarized. Attention was drawn to the probability of the less lethal effect of continuous irradiation for hours during a flare, and to the special protective effect of the body itself for an adequate amount of the vertebral bone marrow at the energy ranges in question, probably enough to minimize the problem with respect to the formed elements of the blood. The same may be true of the liver, kidneys, gut, pancreas, and adrenal glands. Only the important lateral cerebral mantle of gray matter is in a relatively exposed position and might conceivably profit by a special helmet to shield it. Results are summarized of irradiation at the Bragg peak of the pituitary gland in 121 patients with diabetic retinopathy. Salient points in terms of space radiation problems are that 12% of 92 patients failed to develop hypopituitarism on doses effective for the remainder, and that 30% of 92 patients developed extraocular pareses, usually transient. Both sets of facts emphasize again the well-known substantial individual differences in radiation sensitivity and demonstrate that this principle applies as well to protons. It is clear that there is an extreme paucity of data relevant to the peculiar space radiation hazards for man.

A68-80077
HISTOLOGY OF THE SURGICAL RADIOLESION IN THE HUMAN BRAIN AS PRODUCED BY HIGH-ENERGY PROTONS.
William Mair, Bror Rexed, and Patrick Sourander (Uppsala U., Gustaf Werner Inst. and Inst. of Anat., Sweden).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 384–389. 6 refs.
(Contract AF 61(052)-183; Swed. Med. Res. Council, Swed. Tech. Res. Council, and Knut and Alice Wallenberg Found. supported research.

It is possible, by using stereotaxic methods and crossfire technique, with high energy protons to destroy a small selected region of the human brain such as the spinothalamic tract in the midbrain. The irradiated region is sharply demarcated. It is ovoid in shape with a crenated border. Destruction of myelin sheaths, axons, astrocytes, and oligodendroglia occur in the irradiated region, and there are some tiny perivascular hemorrhages in it. Nuclear debris and collections of macrophages are found at the edge of the necrosis Little proliferation of astrocytes is seen around it nine weeks after irradiation. The changes are exactly similar to those seen in goats seven and four weeks after irradiation with the same dose and by the same technique. Tiny, discrete, rounded zones of necrosis are seen in man just rostral to the confluent necrosis, and a similar change was seen in the goats irradiated by this method. They are presumably the result of intersecting beams as they pass to the center of irradiation.

A68-80078
RADIATION ACCIDENTS AND THEIR MANAGEMENT.
Gould A. Andrews (Oak Ridge Inst. of Nucl. Studies, Med. Div., Tenn.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 390–397. 18 refs.
AEC supported research.

Knowledge obtained from radiation accidents and their management is considered as related to space radiation problems. The most important information has to do with the responses to doses in the near-lethal and sublethal ranges. Higher, supralethal doses are rare and are unlikely to be encountered in space. In evaluating acute accidental exposures, it was found that hematologic changes are not only the most serious effects but also the best biological index of exposure dose. Several generalizations are made about their hematologic changes. Treatment consists in a group of measures directed toward carrying the patient over the phase of marrow depression. For the mildest injury all that is needed is a moderately restful environment and avoidance of stress or exposure to infection. For more severe injury a well-organized medical program is needed. In addition to the obvious measures of providing rest and good nutrition, the program may consist of: (1) anti-infective measures; (2) measures to prevent bleeding; and (3) marrow graft therapy. However, a somewhat different situation exists with more protracted exposure. Future needs, obviously, must include collection of further data on radiation effects in man. This information will be vital for the understanding of radiation accidents that are bound to occur despite carefully devised preventive measures in effect. The same information may prove very useful to the space program, although the seriousness of the radiation exposures that will be incurred in outer space is not yet well known.

A68-80079
CLINICAL STUDIES OF RADIATION EFFECTS IN MAN. A PRELIMINARY REPORT OF A RETROSPECTIVE SEARCH FOR DOSE-RELATIONSHIPS IN THE PRODROMAL SYNDROME.
C. C. Lushbaugh, Frank Comas (Oak Ridge Inst. of Nucl. Studies, Med. Div. and Math. Div., Tenn.), and Ruth Hofstra (Oak Ridge Natl. Lab., Tenn.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 398–412. 29 refs.
AEC supported research.

The dose-response relationships for anorexia, nausea, vomiting, fatigue, diarrhea, and death were determined retrospectively without correction for natural incidence of these responses in 100 patients, 93 of whom suffered at the time from various blood dyscrasias. The ED_{50} for the least prodromal response, anorexia, was determined to be 82 ± 32 epigastric rads. The $LD_{50(60)}$, uncorrected for nonradiologic deaths, was found to be 281 ± 44 rads as from a midline exposure of 425 r.

A68-80080
PHYSIOLOGICAL EFFECTS OF SPACE CABIN ATMOSPHERES.
E. M. Roth (Lovelace Found. for Med. Educ. and Res., Albuquerque, N. Mex.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 413–422. 11 refs.

Physiological criteria for the selection of space cabin atmospheres are reviewed. Emphasis is placed on the implication of these factors on engineering constraints and radiobiological considerations. The current operational atmospheres with 5 p.s.i. of 100% oxygen do not appear to significantly effect the radiation hazard within the cabin. Analysis of the complex man–machine interactions and engineering trade-offs suggests that the selection of the ideal space cabin atmosphere must be specific for each space mission in question.

A68-80081
SPACE-FLIGHT-RELATED STRESSES ON THE CENTRAL NERVOUS SYSTEM.

R. L. Schoenbrun and W. R. Adey (Calif. U., Brain Res. Inst. and Dept. of Anat., Los Angeles).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965)
Radiation Research, Suppl. 7, 1967, p. 423–438. 18 refs.
NASA Grant NsG 203-62, Contract AEC AT (11-1)-34, and Grant AF-AFOSR-61-81.

Computerized methods for precise specification of different states on central nervous system function are presented. The effects of centrifuging acceleration, whole-body vibration, and focal brain irradiation on cerebral electrical activity are discussed with special emphasis on temporal lobe structures.

A68-80082
A COMPARISON OF AVERSIONS INDUCED BY X RAYS, TOXINS, AND DRUGS IN THE RAT.
John Garcia and Robert A. Koelling (Harvard Med. School, Dept. of Psychiat., Stanley Cobb Labs. for Psychiat. Res. and Mass. Gen. Hosp., Dept. of Surg., Neurosurg. Serv., Boston).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 439–450. 10 refs.
Grant NIH RH 00068.

A number of test stimuli were paired with a series of three X-ray exposures (54 r each) during a daily drinking period, and subsequently the capacity of the test stimulus to depress water intake in rats was tested. Gustatory stimuli (vinegar, saccharin) acquired strong aversive properties, while a distinctive compartment (visual, auditory, and tactual cues) acquired none. An intermediate effect on fluid intake was established to an olfactory stimulus (perfume). Aversions were established for novel or familiar fluids, preferred or nonpreferred fluids, flavored or unflavored water. Apparently radiation-induced aversions are a form of discrimination learning, easily established for gustatory and olfactory cues, but much more difficult to establish for visual, auditory, or tactual cues. A similar pattern of avoidance reactions was observed following ingestion of a toxin (lithium chloride) and a drug injection (apomorphine hydrochloride) which produce gastrointestinal malaise.

A68-80083
THE EFFECT OF HIGH-ENERGY PARTICLE IRRADIATION ON THE VESTIBULAR MECHANISM IN RABBITS.
Larry W. McDonald (Calif. U., Lawrence Radiation Lab., Donner Lab., Berkeley).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 451–458. 5 refs.

A method of irradiating the inner ear with minimal exposure of the paraflocculer lobe of the cerebellum was presented. A low-dose effect, requiring one to two wk. free of strong vestibular stimulation for its appearance, was observed. A higher-dose effect appeared regardless of strong vestibular stimulation. Further studies in progress were mentioned.

A68-80084
QUANTITATIVE DETERMINATION OF SOME IMIDAZOLE DERIVATIVES IN HUMAN URINE [QUANTITATIVE BESTIMMUNG EINIGER IMIDAZOLDERIVATE IM MENSCHLICHEN URIN].
Karl-Oskar Mosebach, Gertrud Rieck, Susanne Beck, and Rolf Schneider (Bonn U., Physiol.-Chem. Inst., West Germany).
Hoppe-Seyler's Zeitschrift für Physiologische Chemie, vol. 348, Jun. 1967, p. 620–624. 19 refs. In German.

A method is described for the specific determination of L-histidine, imidazoleacetic acid (free acid + 1-ribosyl derivative) and Imidazoelactic acid in human urine. The substances are separated and purified by three stage chromatography, and determined quantitatively by diazotisation; corrections were applied for the variable losses of material, which usually occurred during this procedure, as determined by isotope dilution. All these procedures were performed in one operation. The urine of 11 healthy men contained 321.9±127.0 mg. L-histidine, 4.6±2.9 mg. imidazoleacetic acid (free + that released from 1-ribosylimidazoleacetic acid) and 12.0±6.7 mg. imidazolelactic acid. The method will be used in studies of the metabolism of imidazole derivatives, especially histamine, in relation to the function and malfunction of allergic, nervous and endocrine mechanisms.

A68-80085
CHANGES IN GLUCOSE METABOLISM IN INTESTINAL TISSUE OF RATS BY ADAPTATION TO PROTEIN-RICH NUTRITION [VERANDERUNGEN DES GLUCOSESTOFF-WECHSELS IM RATTENDARM DURCH ADAPTATION AN PROTEINREICHE ERNAHRUNG].
Erwin Scharrer, Kurt Müller, and Hermann Zucker (Munich U., Inst. für Tierphysiol., West Germany).
Hoppe-Seyler's Zeitschrift für Physiologische Chemie, vol. 348, Jun. 1967, p. 720–722. 6 refs. In German.

Blood glucose levels were measured continuously from zero to 18 hr. after a high protein meal in rats adapted either to high protein or to low protein (=high carbohydrate) diets. Glucose concentrations in and differences between aorta and vena cava caudalis were similar in both groups. The difference between aorta and porta vein, however, was significantly smaller in the rats previously adapted to a high protein diet, indicating reduced glucose utilization by intestinal tissue upon adaptation to high protein intake. Data obtained from isolated small intestine support this assumption.

A68-80086
HORMONAL CONTROL OF HYPERCALCEMIA.
D. Harold Copp (Brit. Columbia U., Dept. of Physiol., Vancouver, Canada).
American Journal of Medicine, vol. 43, Nov. 1967, p. 648–655. 44 refs.
MRC AND NRC, Canada supported research.

A history of the development of the calcitonin (thyrocalcitonin) concept in regulating hypercalcemia is presented. The discovery of thyroid as the producing gland is discussed and the subsequent idea of calcitonin being produced in the ultimobranchial tissue is reviewed. The specific action of the hormone in man and animals is covered. Regulatory mechanisms and a model of endocrine control are given.

A68-80087
FREQUENCY AND INTENSITY EFFECTS OF BONE CONDUCTION SIGNALS ON AVERAGED EVOKED AUDITORY POTENTIALS.
Jerome Liebman and James T. Graham (Purdue U., Lafayette, Ind.)
Journal of Auditory Research, vol. 7, Apr. 1967, p. 157–162. 5 refs.
Grant PHS N1601D66.

Twenty-four normal-hearing adult males (median age: 24.3 yr.) were examined by computer-averaged electroencephalographic response (AER) under one control and six experimental conditions of two frequencies (0.5 and 2 kc./s.) and three intensities in the case of BC volumtary threshold (5, 15, and 25 db.) Other stimulus parameters were held constant. Responses were picked up with three cross scalp electrodes (left and right parietal, and vertex positions) and the BC AER examined by judges. The vertex position yielded more stable and orderly data. Neither frequency nor

sequence of intensity presentations exerted any tangible influence on response latency or amplitude. Response latency decreased as stimulus intensity increased, but response amplitude did not change. It may be concluded that signal intensity is related to response latency, but that response amplitude of BC AER is a complex function of stimulus frequency, intensity, and pattern.

A68-80088
MIDDLE EAR MUSCLE EFFECTS ON LOW-INTENSITY SOUNDS.
G. Richard Price (U.S. Army Human Eng. Labs., Aberdeen Proving Ground, Md.)
Journal of Auditory Research, vol. 7, Apr. 1967, p. 119–127. 9 refs.

Experiments in which human judgments of loudness were made for a tone in one ear while another tone was presented to the opposite ear have questioned the role played by the middle ear muscles. Loudness judgments probably involve both central and peripheral factors. In order to evaluate the peripheral factors, cochlear potentials (CP) were measured on 12 lightly anesthetized cats. There were changes in CP to pure tones in one ear (ranging in frequency from 0.2 to 10 kc./s.) from middle ear muscle activity elicited by contralateral 2-sec. pure-tone bursts (ranging from 0.65 to 5 kc./s.) as the tones producing CP were varied in intensity. As the intensity of the measured tone was varied, the size of the effect (in db.) remained constant, unless the tones were close together in frequency.

A68-80089
CAPACITY FOR PROLONGED EXERCISE IN MAN.
Björn Ahlborg (Karolinska Sjukhuset, Dept. of Clin. Physiol. and Mil. Med. Exam. Centre (MMUC), Stockholm, Sweden).
Försvarsmedicin, vol. 3, Suppl. 1, 1967, 193 p. Many refs.

This supplement is concerned with the study of circulatory and metabolic changes during prolonged exercise with special reference to the limitation of the individual capacity for prolonged exercise. Both present and past work is reported. The latter is in the form of reprints of previously published material. In the present study individual capacity for exercise and the limiting factors are elucidated. A test for predicting this capacity is also defined. Two-hundred and fifteen males were examined. They undertook continuous exercise for up to 200 min. to exhaustion. Pulse rate, hemoglobin concentration, leukocyte count, muscle glycogen content and blood glucose are observed. Predictions of capacity can be determined with muscle glycogen determinations by biopsy, but a exercise test procedure seems more practical.

A68-80090
CHLORPROMAZINE OCULAR TOXICITY.
Albin W. Johnson (Dorothea Dix Hosp., Raleigh, N. C.)
North Carolina Medical Journal, vol. 28, Nov. 1967, p. 474–476. 14 refs.

Prolonged administration of chlorpromazine can produce conjunctive pigmentation, lenticular deposits, opacities of the corneal endothelium, stroma and epithelium, and possibly retinal changes. These effects are discussed in terms of their pathologic features, clinical significance, and differentiation from similar ocular changes unrelated to chlorpromazine toxicity. Since visual acuity is rarely affected significantly, it is recommended that patients receiving chlorpromazine be examined at six month intervals and the medication changed only when visual acuity reaches 20/40 or less.

A68-80091
EFFECT OF LIGHT ON THE CHLOROPHYLL FORMATION IN THE "GLUCOSE-BLEACHED" CELLS OF CHLORELLA PROTOTHECOIDES.
Yoshihiro Sokawa and Eiji Hase (Tokyo U., Inst. of Appl. Microbiol. and Tokugawa Inst. for Biol. Res., Tokyo, Japan).
Plant and Cell Physiology, vol. 8, Oct. 1967, p. 495–508. 16 refs.
Min. of Educ. supported research.

In the present study with glucose-bleached cells of *Chlorella protothecoides*, it was found that the light-enhanced chlorophyll formation proceeds, although at a somewhat lower rate, under aeration of CO_2-free air. All the experiments were done under these non-photosynthetic conditions to exclude any influence of photosynthates. The effect of light (from daylight fluorescent lamps) on the chlorophyll formation in the glucose-bleached algal cells was saturating at about 1,000 lux. Blue light was found to be most effective; yellow, green and red light following in the order of decreasing effectiveness. When the bleached algal cells were illuminated for a short period in the lag phase of chlorophyll formation and subsequently incubated in darkness, there occurred an appreciable enhancement of chlorophyll formation in the dark. When the short illumination was applied at different times of the lag phase, the enhancement was induced to almost the same extent. But the longer the duration of the illumination during the lag phase, the greater was the enhancement of chlorophyll formation in the subsequent dark incubation. In such experiments blue light was most effective and red light least. An intervenient illumination of the bleached cells at lower temperatures or under the atmosphere of N_2 produced little or no enhancement of the chlorophyll formation in the subsequent dark incubation. It was concluded that the light enhancement of chlorophyll formation in the glucose-bleached algal cells is mediated by a non-chlorophyllous photoreceptor(s), absorbing maximally blue and yellow light, and that a light-induced change of the photoreceptor is immediately followed by a certain dark (temperature-dependent and aerobic) process(es) which is connected, directly or indirectly, to the chlorophyll synthesis.

A68-80092
A STUDY OF THE METABOLISM RATES OF ALCOHOL IN THE HUMAN BODY.
Robert P. Shumate, Richard F. Crowther, and Mansour Zarafshan (Ind. U., Dept. of Police Admin., Bloomington).
Journal of Forensic Medicine, vol. 14, Jul.–Sep. 1967, p. 83–100. 16 refs.
Contract PHS 201457.

Methods and techniques for measurement of the blood alcohol levels in humans were studied, and the differences in rates at which individuals metabolize alcohol at various times were examined. The blood alcohol level of each subject was brought to 0.15% and then followed to the zero point. Five min. intervals were maintained between tests. The data were analyzed in terms of a linear stochastic difference equation. The normal rate of decline in blood alcohol was estimated to be just over 0.001% for five min. intervals. The test series indicated that the elimination rate is linear. The data failed to reveal any relationship between the amount of alcohol in the blood and the elimination rate. Subjective evidence indicated that the length of instability was related to the emotional condition of the subject. The results showed that the rate of disappearance in the same individual at different times was nonsignificant. There were, however, significant differences in the alcohol metabolism rates of different individuals.

A68-80093
EFFECTS OF ALCOHOL ON MYOCARDIAL CONTRACTILITY.

W. R. Webb, D. N. Gupta, W. A. Cook, W. L. Sugg, F. A. Bashour, and M. O. Unal (Tex. U., Southwestern Med. School, Depts. of Surg. and Med., Dallas).
Diseases of the Chest, vol. 52, Nov. 1967, p. 602–605. 13 refs.
Grants PHS HE-08946 and PHS HE-10128.

Ethyl alcohol in concentrations up to 900 mg. per cent was found to have no appreciable effect on myocardial contractility in the isolated heart–lung preparation in the open chest dog. This preparation tended to evaluate primary effects of a drug on the heart and minimize secondary effects. These findings are in contrast to the myocardial depression caused by alcohol in the intact animal that is unprotected from the secondary effects of alcohol.

A68-80094
PATHOLOGICAL DEVELOPMENT OF RETINAL LASER PHOTOCOAGULATIONS.
J. Marshall and J. Mellerio (Inst. of Ophthalmol., Depts. of Anat. and Physiol. Optics, London, Great Britain).
Experimental Eye Research, vol. 6, Oct. 1967, p. 303–308. 7 refs.
Min. of Defence and Med. Res. Council supported research.

The histopathology of laser lesions of the rabbit retina has been studied. The production of sufficient scar tissue to form a bridge between retina and pigment epithelium and choroid requires some 50 mJ. of ruby laser energy (power density 10^6 w. cm.$^{-2}$ at the retina). This dose also produces a hemorrhage in 25% of the lesions, and always involves the vitreous in undesirable vitreo-retinal attachments. The clinical significance of these findings is considered.

A68-80095
CLINICAL APPLICATION OF SPACE MEDICINE TECHNOLOGY.
Albert H. Schwichtenberg (Ohio State U., Dept. of Prevent. Med., Columbus).
(Am. Med. Assn., 20th Clin. Conv., Las Vegas, Nov. 29, 1966). Journal of the American Medical Association, vol. 201, Jul. 24, 1967, p. 247–250.

This communication is concerned with the contributions which space technology is making to clinical medicine and related medical and life sciences. Major areas discussed are: (1) the extension of knowledge of tolerance vs. performance limits of humans subjected to single and multiple stress; (2) new concepts and applications of biological instrumentation, which are made possible by the space and defense systems' research and development effort; and (3) the reawakening of interest in what constitutes the range of so-called normal individuals and the implications in clinical evaluations. Mentioned briefly are the advances in the integration of man with machine and the application of new-management techniques and systems engineering approaches necessary for the undertaking of large-scale medical research and development programs, as well as to fulfill the needs for large medical center development, management, and operation.

A68-80096
EFFECTS OF LIGHT ON THE DEOXYRIBONUCLEIC ACID FORMATION AND CELLULAR DIVISION IN CHLORELLA PROTOTHECOIDES.
Yoshihiro Sokawa and Eiji Hase (Tokyo U., Inst. of Appl. Microbiol. and Tokugawa Inst. for Biol. Res., Tokyo, Japan).
Plant and Cell Physiology, vol. 8, Oct. 1967, p. 509–522. 12 refs.
Min. of Educ. supported research.

In the present study with glucose-bleached cells of *Chlorella prototheocoides*, the effects of light on the deoxyribonucleic acid (DNA) formation and cellular division were investigated in the presence of 3-(p-chlorophenyl)-1, 1-dimethylurea or under aeration of CO_2-free air to exclude the intervening influence of photosynthetic process. It was revealed that light severely suppresses the DNA formation and cellular division of the glucose-bleached cells while enhancing remarkably their greening. The suppression was saturated at the light intensity of about 1,000 lux. Blue light was most effective, being followed by green, yellow and red light in the order of decreasing effectiveness. Further experiments unveiled that light exerts two apparently opposing effects on the DNA formation depending upon the time of application during the incubation of algal cells. When the algal cells were illuminated only during the lag period before the active DNA synthesis, there occurred an enhancement of the DNA synthesis occurring during the subsequent dark incubation. When, on the other hand, the cells were transferred to the light from darkness at or after the start of the DNA synthesis, it caused an almost complete abolition of the subsequent synthesis of DNA in the algal cells. No such effects of light were observed with ribonucleic acid and protein (total). These findings were discussed in relation to the process of chlorophyll formation occurring concurrently in the algal cells.

A68-80097
CLINICAL ASPECTS OF COMMERCIAL AVIATION MEDICINE.
George J. Kidera (United Air Lines, Inc., Med. Dept., Chicago, Ill.)
(Am. Med. Assn., 20th Clin. Conv., Las Vegas, Nov. 29, 1966). Journal of the American Medical Association, vol. 201, Jul. 24, 1967, p. 242–246.

Problems of maintaining commercial aviation flying personnel in physical fitness are discussed. Physical disorders such as angina pectoris, atherosclerosis and diabetes mellitus and what is done about them is presented. An exercise program for improving heart function is described and endorsed. A stringent program for detecting diabetes in both pilot applicants and present personnel is explained. Passenger ability to fly from a medical standpoint is also discussed, and it is noted that many physicians are ignorant of aircraft environments at high altitude and hence may wrongly advise patients on flying hazards.

A68-80099
EFFECTS OF ACTH AND WHOLE-BODY X-IRRADIATION ON THE CONCENTRATIONS OF ENZYMES, NICOTINAMIDE NUCLEOTIDES AND CYTOCHROMES IN RAT-ADRENAL.
Nagasumi Yago, Saburo Omata, Shigeru Kobayashi, and Shogo Ichii (Natl. Inst. of Radiol. Sci., Physiol. Lab., Chiba, Japan).
Journal of Biochemistry, vol. 62, Sep. 1967, p. 339–344. 24 refs.

The levels of deoxyribonucleic acid (DNA), ribonucleic acid (RNA), protein, nicotinamide nucleotides ($NADH_2$, $NADPH_2$), enzymes and cytochromes P-450 and b_5 in rat-adrenals were determined 24 hr. after a single injection of adrenocorticotrophic hormone (ACTH) (10 units) and 24, 48 and 72 hr. after whole-body X-irradiation at a lethal dose (1,000 r). At these times, adrenal nuclei showed abnormally high RNA polymerase activity. The concentrations of nicotinamide nucleotides did not change during the experimental periods. In mitochondria, succinate dyhydrogenase increased rather abruptly 72 h after X-irradiation, while $NADH_2$ cytochrome c reductase decreased significantly during the experimental periods. P-450 was increased after 24 hr. but was significantly decreased after 48 and 72 hr. $NADPH_2$ cytochrome c reductase remained unchanged after 24 and 48 hr. but had decreased after 72 hr. In microsomes, cytochrome b_5 and $NADH_2$ cytochrome c reductase decreased significantly after ACTH and X-irradiation. P-450 and $NADPH_2$ cytochrome c reductase remained at the control levels, with a temporary increase of the former 24 hr. after X-irradiation.

A68-80100
CHANGES IN CONTENTS OF KETO ACIDS IN *CHLORELLA* CELLS DURING THEIR SYNCHRONIZED LIFE CYCLE.
Tamotsu Kanazawa, Kimiko Kanazawa, and Takao Nishimura (Tokugawa Inst. for Biol. Res., Tokyo, Japan).
Plant and Cell Physiology, vol. 8, Oct. 1967, p. 529–533. 10 refs.

The change in *Chlorella ellipsoidea* of keto acids (α-ketoglutarate and pyruvate) during the synchronized life cycle were observed. Maximum values were found for both compounds during the L_1 stage. It was indicated from the results that a close relationship exists between the two keto acids and the corresponding amino acids (glutamic acid and alanine). Deoxyribonucleic acid was also found to reach a maximum at the L_3 stage just before cell division. After plotting the curves of the glutamic/α-ketoglutarate and alanine/pyruvate ratios, a close parallel was found between these ratios during the life cycle and indicated an equilibrium between the four components.

A68-80101
THE EFFECT OF PULSE DURATION ON TTS PRODUCED BY IMPULSE NOISE.
John L. Fletcher and Michel Loeb (U.S. Army Med. Res. Lab., Fort Knox, Ky.)
Journal of Auditory Research, vol. 7, Apr. 1967, p. 163–167. 6 refs.

Enlisted volunteers with normal hearing through 8 kc./s. were given pre- and post-exposure Békésy audiometry through 18 kc./s. A Benson and Associates spark-gap generator produced two durations (36 and 92 μsec.) of impulses at 166 db. SPL as measured by a specially constructed microphone flat to 500 kc./s. On successive days, each subject was exposed to additional numbers of impulses until a permanent threshold shift of 20 db. was achieved. Duration was a significant parameter: 10 to 25 impulses at 92 μsec. had about the same effect as 75 to 100 impulses at 36 μsec. duration. With the longer duration there was more temporary threshold shift at the lower frequencies, but for both durations a very broad frequency range was affected.

A68-80103
BEHAVIORAL IMPAIRMENT ASSOCIATED WITH SMALL DOSES OF CARBON MONOXIDE.
Rodney R. Beard and George A. Wertheim (Stanford U., School of Med., Dept. of Prevent. Med., Palo Alto, Calif.)
(Am. Public Health Assn., 94th Ann. Meeting, San Francisco, Nov. 1, 1966).
American Journal of Public Health, vol. 57, Nov. 1967, p. 2012–2022. 6 refs.
Army Med. Res. and Develop. Command and Armed Forces Epidemiol. Board supported research.

Improvement is needed in the methods of setting standards of air quality. In establishing such standards, the effects of various pollutants upon human performance should be considered. Toward this end, the effects of exposure to carbon monoxide upon the ability of 18 young adults to discriminate short intervals of time were studied. Deterioration of performance was observed. This occurred after 90 min. at 50 p.p.m., and at proportionately shorter times after exposure to higher concentrations up to 250 p.p.m. Experiments with rats, using operant behavior schedules of reinforcement, showed rapid and marked disruption of the ability to judge time, with a significant decrement apparent after 11 min. exposure to 100 p.p.m. during performance on a DRL schedule. It is suggested that methods derived from experimental psychology can contribute materially to the evaluation and understanding of both gross and subtle effects of CO as an air pollutant and can thereby aid in the formulation of standards of air quality.

A68-80104
A COMPARATIVE STUDY OF VISUAL, AUDITORY AND SOMATOSENSORY EEG RESPONSES IN MAN.
L. Cigánek (Slovak Acad. of Sci., Inst. of Normal and Pathol. Physiol., Dept. of Electrophysiol. of Nervous System, Bratislava, Czechoslovakia).
Experimental Brain Research, vol. 4, Oct. 24, 1967, p. 118–125. 16 refs.

The electroencephalographic responses (evoked potentials) to light flashes, clicks and electric stimulation (shocks) of the median nerve, recorded in the midline occipital region in the same group of 20 normal subjects, were studied. The average responses of the whole group as well as the individual average responses of separate subjects to stimuli of all three modalities present the same waves. There are differences in latency and amplitude, but no significant differences in the shape. The auditory and somatosensory responses are less prominent and nearly suppressed with higher stimulus frequencies. The origin and possible physiological significance of the described responses is discussed. Their non-specific character is suggested.

A68-80105
SEX DIFFERENCES IN THE MAGNITUDE AND PRACTICE DECREMENT OF THE MULLER–LYER ILLUSION.
Robert E. Dewar (Calgary U., Canada).
Psychonomic Science, vol. 9, Oct. 25, 1967, p. 345–346. 8 refs.
Grants DRB, Canada 9425-18 and NRC, Canada APA-141.

A comparison was made between male and female subjects on the magnitude and practice decrement of the Muller–Lyer illusion. Over a series of 400 trials, female subjects showed a slightly (but not significantly) higher illusion than did males. Male subjects showed a more rapid practice decrement than did females. The results were discussed in terms of field-dependence and attention.

A68-80106
TIME OF DAY EFFECTS ON PERFORMANCE IN A RANGE OF TASKS.
M. J. F. Blake (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, Great Britain).
Psychonomic Science, vol. 9, Oct. 25, 1967, p. 349–350. 9 refs.
Brit. Med. Res. Council supported research.

Performance on eight tasks ranging from novel laboratory tests to highly practiced familiar skills was measured at five times of day between eight A.M. and nine P.M. Five tasks showed a consistent tendency for improvement in efficiency from eight A.M. through nine P.M.; in one task there was deterioration; and in the remaining two the effects were not significant. The results suggest that the observed trends are related to the underlying state of arousal as indicated by body temperature.

A68-80107
PATTERN DEGRADATION, DISCRIMINATION DIFFICULTY, AND QUANTIFIED STIMULUS ATTRIBUTES.
D. R. Brown and John S. LoSasso (Purdue U., Lafayette, Ind.)
Psychonomic Science, vol. 9, Oct. 25, 1967, p. 351–352. 9 refs.
Grant NICHHD HD-00909.

Diffusion and brightness contrast were varied to degrade random polygons. Latency to discriminate five-choice oddity problems was a function of noise conditions and was linearly related to measures of compactness, jaggedness, and rotation under noisy viewing conditions.

A68-80108
CONTEXTUAL EFFECTS FOR CATEGORY JUDGMENTS BY PRACTICED SUBJECTS.
Allen Parducci and Linda F. Perrett (Calif. U., Los Angeles).
Psychonomic Science, vol. 9, Oct. 25, 1967, p. 357–358.
Grant PHS HD-00923.

Category judgments of size were obtained for different sets of squares over a period of four wk. Two subjects established fixed scales of judgment. The other two adjusted their scales to the particular set presented in each experimental session. These adjustments were consistent with a range-frequency model.

A68-80109
TWO-FLASH THRESHOLD, SKIN CONDUCTANCE AND SKIN POTENTIAL.
Michael J. Maley (Minn. U., Minneapolis).
Psychonomic Science, vol. 9, Oct. 25, 1967, p. 361–362. 8 refs.

The subjective threshold of fusion of paired light flashes (two-flash threshold) and tonic levels of skin conductance and skin potential were simultaneously measured in samples of drug free and medicated psychiatric patients. Significant intercorrelations were found between the two-flash threshold and a range corrected index of skin conductance and potential in both patient samples.

A68-80110
VISUAL DISAPPEARANCES PRODUCED BY INTENSITY CHANGES IN LUMINOUS TARGETS.
Richard J. Rose (Ill. U., Urbana).
Psychonomic Science, vol. 9, Oct. 25, 1967, p. 363–364. 8 refs.
NSF supported research.

Electroluminescent lamps were presented as simple stimuli in parafoveal vision. Both increases and decreases in voltage supplied to the lamps effect perceptual disappearances of the stimuli. Selective fragmentation of multi-unit targets reveals evidence of inhibitory interaction in the visual system.

A68-80111
HAPTIC JUDGMENT OF THE MULLER–LYER ILLUSION BY SUBJECTS OF DIFFERENT AGES.
Ray Over (Otago U., Dunedin, New Zealand).
Psychonomic Science, vol. 9, Oct. 25, 1967, p. 365–366. 5 refs.
New Zealand U. Grants Comm. supported research.

Age differences have been commonly found in the magnitude of the visual illusion obtained with the Müller–Lyer illusion. The present experiment has examined haptic (tactual-kinesthetic) judgments of this figure by subjects of different ages. Young children, older children, and adults did not differ in amount of haptic illusion. The bearing of this finding on Piaget's analysis of age differences in visula illusion is discussed.

A68-80112
SCALING OF SENSITIVITY TO TORQUE.
LeRoy A. Stone and David R. Skeen (N. Dak. U., Grand Forks).
Psychonomic Science, vol. 9, Oct. 25, 1967, p. 367–368.
Grant NIMH 1-F3-MH-12,312-01.

Two groups of subjects judged a sequence of torque presentations with instructions that they judge heaviness using category scale and magnitude estimation procedures. Power functions appropriately described the psychophysical relationship between the subjective estimations and g-cm. Subjective torque was classified as a prothetic judgment continuum based on two criteria.

A68-80113
CIRCADIAN RHYTHM IN THE SEROTONIN CONTENT OF THE RAT PINEAL GLAND: REGULATING FACTORS.
Solomon H. Snyder, Julius Axelrod, and Mark Zweig (Natl. Inst. of Mental Health, Lab. of Clin. Sci., Bethesda, Md.)
Journal of Pharmacology and Experimental Therapeutics, vol. 158, Nov. 1967, p. 206–213. 28 refs.

There is a marked circadian rhythm in the serotonin content of the rat pineal gland. The rhythm can be inverted 180° by reversal of the lighting regimen. Phase inversion is complete in six days. The activities of 5-hydroxytryptophan decarboxylase and monoamine oxidase in the pineal gland do not exhibit a circadian variation. The absolute increase in pineal gland serotonin produced by tryptophan or 5-hydroxytryptophan injection is much greater than in other tissues but does not vary at different times of day and night. Treatment with β-phenylisopropylhydrazine, a monoamine oxidase inhibitor, prevents the nocturnal decline of pineal serotonin but does not alter daytime levels. Treatment with actinomycin D partially inhibits the daytime increase in pineal serotonin.

A68-80114
EFFECT OF EXERCISE ON THE THYROID GLAND.
Buck A. Rhodes (Johns Hopkins U., Div. of Nucl. Med., Baltimore, Md.)
Nature, vol. 216, Dec. 2, 1967, p. 917–918. 14 refs.
PHS supported research.

The effect of exercise on iodine renewal in the thyroid as well as storage of iodine in that gland was measured in rats. Rats were not subjected to stress as their running was spontaneous. The rate of renewal using iodine-124 and iodine-125 was not significantly different in exercising or non-exercising groups. But the exercising group had twice less total iodine in the thyroid. It was concluded that the more the rats exercised the less the storage of iodine. It was believed this is due to greater utilization of iodine in the thyroid for hormone production.

A68-80115
NUCLEOSIDE SYNTHESIS UNDER POTENTIALLY PREBIOTIC CONDITIONS.
C. Reid, L. E. Orgel (Salk Inst. for Biol. Studies, San Diego, Calif.), and C. Ponnamperuma (NASA, Ames Res. Center, Moffett Field, Calif.)
Nature, vol. 216, Dec. 2, 1967, p. 936.

Aspects of nucleoside synthesis under prebiotic conditions are discussed. It was found that adducts of deoxyribose or ribose with adenine, cytosine, or guanine were formed when the dry bases and sugar are heated together at 130°–170°C. for a few minutes. One of the resulting compounds was similar to deoxyadenosine and is discussed as to its chemical nature.

A68-80116
EFFECT OF INCREASED METABOLISM AND OF HYPERPHAGIA ON DIETARY AMINO ACID IMBALANCE IN THE RAT.
John R. Beaton (Western Ontario U., Dept. of Physiol., London, Canada).
Canadian Journal of Physiology and Pharmacology, vol. 45, Nov. 1967, p. 1011–1019. 5 refs.
MRC and DRB, Canada supported research.

In male rats, the effects of cold exposure (6°C.) on dietary amino acid imbalances were investigated. Exposure to cold throughout the experimental period (28 days) prevented the decreased food intake and body weight gain observed at 24°C. in rats fed a 6% fibrin diet supplemented with 0.4% DL-methionine and 0.6% DL-phenylalanine. It was also observed that subsequent exposure to cold eliminated these effects of an existing imbalance previously induced at 24°C. With a 10% fibrin diet supplemented with 0.6% DL-methionine and 0.9% DL-phenylalanine, no pronounced effect

attributable to an amino acid imbalance was observed at 24°C. It is concluded that exposure to cold prevents the deleterious effects of an amino acid imbalance superimposed on a 6% protein diet, and subsequent exposure to cold eliminates these effects of an existing imbalance. L-Thyroxine, injected daily at a level of 30 μg./100 g. body weight, simulated cold exposure in that it caused an increased food intake in rats fed a 6% fibrin-imbalanced diet. In hypothalamic-hyperphogic rats, a deleterious effect of a 6% fibrin-imbalanced diet was apparent initially; after 10 days' feeding, lesioned rats fed a 6% fibrin diet ceased to gain weight whereas those fed the imbalanced diet continued to do so.

A68-80117
CHANGES IN BLOOD LIPID CONCENTRATION AND CELL COUNTS FOLLOWING DECOMPRESSION SICKNESS IN RATS AND THE INFLUENCE OF DIETARY LIPID.

R. B. Philp, C. W. Gowdey, and M. Prasad (Western Ontario U., Dept. of Pharmacol., London, Canada).

Canadian Journal of Physiology and Pharmacology, vol. 45, Nov. 1967, p. 1047–1059. 24 refs.
MRC, Canada supported research.

The effects were studied of dietary fat, alimentary lipemia, and a lipemia-clearing agent (partially depolymerized hyaluronic acid) upon decompression sickness by means of a standardized technique which produces a high incidence of "bends" in rats of suitable weight. Hematological changes were studied in rats fed meals of different fat contents and in rats with bends of different severities. The results indicated that alimentary lipemia increased susceptibility to bends; that this trend could be reversed partially with a lipemia-clearing agent; and that platelet counts decreased (i) after a fatty meal, (ii) after decompression, and (iii) after an attack of bends. In rats which were severely affected with aeroembolism both platelet counts and plasma lipids (as indicated by the plasma optical density) were greatly reduced and marked hemoconcentration was observed. It is postulated that intravascular bubbles triggered the aggregation of platelets and that lipemia, which increases platelet adhesiveness, exaggerated this effect. The obstruction of small vessels by thrombi composed of bubbles, platelets, and lipids could cause a loss of fluid from the vascular bed with subsequent hemoconcentration.

A68-80118
ABSENCE OF HYPOCALCEMIC ACTIVITY IN CHICKEN THYROID.

Leon Kranitz and E. A. Puil (Brit. Columbia U., Fac. of Dentistry, Vancouver, Dept. of Oral Biol., Canada).

Canadian Journal of Physiology and Pharmacology, vol. 45, Nov. 1967, p. 1099–1103. 8 refs.
Grant NRC, Canada DA-156.

Extracts of chicken thyroid were tested for hypocalcemic activity in the rat. No activity was found in extracts representing up to an equivalent of 1 g. of fresh thyroid tissue, in contrast to the pronounced hypocalcemic activity obtained with a 10-mg. and 25-mg. equivalent weight of hog thyroid.

A68-80119
ANALYSIS OF THE BIOLOGICAL VALUE OF NUTRITIVE PROTEINS, XII [ZUR BESTIMMUNG DER BIOLOGISCHEN WERTIGKEIT VON NAHRUNGSPROTEINEN, XII].

Ernst Kofrányi and Friedrichkarl Jekat (Max-Planck-Inst. für Ernährungsphysiol., Dortmund, West Germany).

Hoppe Seyler's Zeitschrift für Physiologische Chemie, vol. 348, Jan. 1967, p. 84–88. In German.

The biological value of proteins in mixtures of egg with algae, maize, rice and soya was determined in balance experiments on humans. In agreement with earlier findings, there was an optimal composition for each mixture, in which the turnover (=requirement) was at minimum. The minimal point was bisected by two straight lines. A standardization procedure was described, whereby results for the nitrogen turnover of different persons can be compared. It was shown that with natural foods the biological value of the protein mixture does not depend upon single limiting amino acids; a decreased level of essential amino acids can be partly compensated by unspecific nitrogen carriers.

A68-80120
NOTES ON THE GASTRO-DUODENAL ULCER IN FLYING PERSONNEL [NOTES SUE L'ULCERE GASTRO DUODENAL DANS LE PERSONNEL NAVIGANT].

R. Pannier and P. Francoz.

Revue de Médecine Aéronautique et Spatiale, vol. 6, 2nd Trimester, 1967, p. 17–20. In French.

A discussion with clinical observations is presented on the appearance of ulcers in flying personnel. Etiopathogenesis and treatment are discussed. The role played by occupational factors in the pathogenesis are elucidated. Therapy with drugs and hospitalization and determination of flight fitness are analyzed.

A68-80121
COMPARISON OF CEREBRAL RHEOGRAPHY TRACES AND OF CAROTIDOGRAMS IN NORMAL AND PATHOLOGIC SUBJECTS [COMPARAISON DES TRACES DE RHEOGRAPHIE CEREBRALE ET DES CAROTIDOGRAMMES CHEZ LE SUJET NORMAL ET EN PATHOLOGIE].

R. Carre, J. Demange, and J. Pernod.

Revue de Médecine Aéronautique et Spatiale, vol. 6, 2nd Trimester, 1967, p. 13–15. In French.

The various methods used to study the different parameters of blood flow show, besides technical difficulties, problems in interpretation. The comparison between these methods points out that none is perfect. The goal of these studies is to correlate the records obtained by rheography and carotidograms in normal and pathological subjects. These methods are both of use in diagnostic and clinical aspects of aerospace medicine.

A68-80122
USING RADIOLOGY IN THE ANALYSIS OF DIFFERENT FACTORS INVOLVING AN INJURIOUS POSTURE OF THE PILOT DURING EJECTION [UTILISATION DE LA RADIOLOGIE DANS L'ANALYSE DES DIFFERENTS FACTEURS ENTRAINANT UNE MAUVAISE POSITION DE PILOTE A L'EJECTION].

Roland-Paul Delahaye, Henri Seris, Henri Mangin, and Robert Auffret. (Centre d'Essais en Vol, Lab. of Aerospace Med., Brétigny-sur-Orge, France).

Revue de Médecine Aéronautique et Spatiale, vol. 6, 2nd Trimester, 1967, p. 11–12. In French.

Radiology is used to study factors in vertebral factures during ejection. Some of these factors are external such as poor parachute-folding, or a poorly fitted helmet. The most important factor though is the position of the pilot. The adjustment of seat height is essential and should not be changed at time of ejection. The position of the legs is not as important, but the feet should be kept on the rudder bar. The body is more stable then and the back is flattened against the cushions. If there are no leg clamps it is imperative to rest the feet on the leg rests. Certain abnormalities of the spinal column contraindicate ejection.

A68-80123
AMMONIA AND THE REGULATION OF ACIDITY IN HUMAN ECCRINE SWEAT.

Taketoshi Morimoto (Kyoto Prefectural Coll. of Med., Dept. of Physiol., Kamigyoku, Japan) and Robert E. Johnson (Ill. U., Dept. of Physiol. and Biophysics, Urbana).
Nature, vol. 216, Nov. 25, 1967, p. 813–814. 20 refs.
NASA supported research.

Correlations between acidity and electrolytes in human eccrine sweat were made. Sweat was collected and analyzed from men and women after heavy physical exercise. The highest coefficient of correlation was found between pH and ammonia. As acidity increased the ammonia concentration increased, and those of sodium and chloride decreased. When sweating increased, ammonia decreased in concentration and alkalinity increased. Fourteen amino acids were found in the sweat, and carbon dioxide tension was measured. It was concluded that several buffer systems may be present.

A68-80124
INHIBITION OF LIPOLYSIS BY GLUCOSE OR LACTATE ADMINISTRATION IN FASTING MAN.
E. G. Debbas, David V. Habif, and Gabriel G. Nahas (Columbia U., Coll. of Physicians and Surgeons, Depts. of Anesthesiol. and Surg., New York, N. Y.)
(Am. Coll. of Surgeons, 53rd Clin. Congr. Proc., Chicago, Ill., Oct. 1967).
Surgical Forum, vol. 18, 1967, p. 358–359.

Healthy fasting men were administered glucose or lactate after norepinephrine. With glucose administration free fatty acids decreased significantly. Results indicated the rise in blood glucose concurrent with insulin increase inhibited lipolysis. This may affect myocardial fat utilization.

A68-80125
EFFECT OF NEGATIVE PRESSURE ON COMPLIANCE AND VENOUS ADMIXTURE.
Yoonok Kim, Christen C. Rattenborg, Mohamad R. Salem, and Duncan A. Holaday (Chicago U., Dept. of Surg., Sect. of Anesthesiol., Ill.)
(Am. Coll. of Surgeons, 53rd Clin. Congr. Proc., Chicago, Ill., Oct. 1967).
Surgical Forum, vol. 18, 1967, p. 203–204.
Grant PHS HE 08766 04.

Alveoli in dogs, which are collapsed by monotonous ventilation, endotracheal suctioning, or compression of the chest require pressures between 20 and 30 cm. H_2O to be re-expanded. There is no simple relationship between given values of lung compliance and the degree of venous admixture or shunting. It may be assumed that regions which readily become atelectatic were perfused poorly. It also may be assumed that patients who cannot produce inspiratory forces above 25 cm. H_2O are unable to re-expand nonventilated alveoli.

A68-80126
EFFECT OF RESPIRATORY AND METABOLIC ACIDOSIS ON MYOCARDIAL CONTRACTILITY.
Donald L. Caress, Alfred S. Kissack, Alvin J. Slovin, and Jackson H. Stuckey (State U.–Kings County Hosp. Center, Dept. of Surg., Brooklyn, N. Y.)
(Am. Coll. of Surgeons, 53rd Clin. Congr. Proc., Chicago, Ill., Oct. 1967).
Surgical Forum, vol. 18, 1967, p. 176–178.
PHS and AHA supported research.

Respiratory acidosis was induced in seven dogs with a 30% CO_2–71% O_2 mixture and metabolic acidosis by 8.8% lactic acid. Metabolic acidosis depressed both myocardial contractility and peripheral resistance, but sodium bicarbonate corrected contractility. Respiratory acidosis only depressed the myocardial activity when the pH was below 7.0.

A68-80127
BIOMAGNETIC INSTRUMENTATION OF HEART.
Gerhard M. Baule (N. Y. State U., Upstate Med. Center, Dept. of Elec. Eng., Syracuse).
(Med. Soc., State of N. Y., 160th Ann. Meeting, New York City, Feb. 16, 1966).
New York State Journal of Medicine, vol. 67, Dec. 1, 1967, p. 3095–3100.

The development of magnetocardiography is described. An instrument is produced that is capable of taking records similar to leads I and aVf with no attached electrodes and in less than a minute. This use of magnetic detection will reveal electrical activity of the heart not found in the electrocardiogram. A unique type of vortex lead field is described, and it will emphasize tangential components. The record of the magnetic flux of the heart will be somewhat similar to electrocardiograms.

A68-80128
THE EXTENT OF THE DEPENDENCY ON AGE OF NON-SHIVERING THERMOGENESIS IN GUINEA PIGS [DAS AUSMASS DER ZITTERFREIEN THERMOGENESE DES MEERSCHWEINSCHENS IN ABHANGIGKEIT VOM LEBENSALTER].
E. Zeisberger, K. Brück, W. Wünnenberg, and C. Wietasch (Marburg/Lahn U., Physiol. Inst., West Germany).
Pflügers Archiv für die gesamte Physiologie, vol. 296, Sep. 15, 1967, p. 276–288. 22 refs. In German.
Deut. Forschungsgemeinschaft supported research.

The dependency of the maximum extent of non-shivering thermogenesis on age was determined in guinea pigs. 0 to an average of 11 mo. of age using the following methods: (1) the noradrenaline-test which measures the increase in oxygen uptake on a noradrenaline injection; and (2) the "blocking test" which evaluates quantitatively the relationship between electrical activity of the musculature and oxygen uptake before and after blockade of non-shivering thermogenesis by a β-receptor blocking agent. In the newborn guinea pig non-shivering thermogenesis amounted to 250% of the basal metabolic rate. It decreased to 10–15% within four wk. in animals which were reared in a warm environment. In animals reared in the cold or adapted to a cold environment (+3°C.) after having been reared in a warm environment, the non-shivering thermogenesis amounted to about 60% at the age of three mo. and to no more than 40% at the age of nine mo. With lower adaptation temperatures no larger, but smaller amounts of non-shivering thermogenesis were obtained. The loss of non-shivering thermogenesis was accompanied by a reduction of the brown adipose tissue.

A68-80129
CENTRAL NYSTAGMUS IN THE CAT.
Robert I. Kohut (Fla. U., Dept. of Surg., Div. of Otolaryngol., Gainesville) and Cesar Fernandez (Chicago U., Dept. of Surg., Div. of Otolaryngol., Ill.)
Annals of Ontology, Rhinology and Laryngology, vol. 76, Oct. 1967, p. 851–860. 12 refs.
Grants PHS NB-07007-01, PHS NB-17856-05, and PHS IE NB-01330-10.

Using chronic electrode implantation, electrical stimulation of the mesodiencephalon of healthy, adult cats produced central nystagmus. The sensitive area of the diencephalon is described and histologically demonstrated. The nystagmus was generally away from the side of implantation. Optokinetic or vestibular stimulation altered or was altered by central nystagmus. There was no apparent effect on equilibrium, by stimulation of the nystagmogenic area, with nystagmus production. The described responses are compared with a previously reported phenomenon in the rabbit.

A68-80130
SOME EFFECTS OF HYPERBARIC OXYGENATION ON BACTERIA AT INCREASED HYDROSTATIC PRESSURES.
Claude E. ZoBell and Leslie L. Hittle (Calif. U., Scripps Inst. of Oceanog., San Diego).
Canadian Journal of Microbiology, vol. 13, Oct. 1967, p. 1311–1319. 22 refs.
Grant NSF GB-4240.

The adverse effects of hyperbaric oxygenation on the reproduction and survival of bacteria are augmented by increased hydrostatic pressure. Different bacterial species differ considerably in their tolerance of increased hydrostatic pressure as well as for increased partial pressure of oxygen. Although their generation times may be lengthened and their reproduction rates retarded by increased pressures, most species of well-known bacteria are able to grow at hydrostatic pressures as high as 200–400 atm. In closed systems at 1 atm. certain aerobic bacteria grow well, or sometimes better, in nutrient media in which the partial pressure of oxygen is five to ten times higher than that in the normal atmosphere (PO_2 ca. 0.2 atm. equivalent to a dissolved oxygen content of ca. 7 μg./ml.), but such increased concentrations of oxygen (35–70 μg./ml.) are injurious at substantially increased hydrostatic pressures, for example, 5–25 atm. *Escherichia coli, Bacillus subtilis, Bacillus megaterium, Pseudomonas enalia, Pseudomonas perfectomarinus,* and *Serratia marinorubra* were sterilized within a day or two by compression to 100 atm. in media having a dissolved oxygen content of 35 μg./ml. All six species thrived at 100 atm. in nutrient media having an initial oxygen content of 7 μg./ml. and they grew well in media with an oxygen content of 35 μg./ml. at 1 atm.

A68-80131
INTRAOCULAR PRESSURE DURING PRESSURE BREATHING. II. GLAUCOMA.
Pawel Segal, Lech Gebicki, Stanislaw Janiszewski, and Janina Skwierczyńska (WAM School of Med., III Dept. of Internal Med. and Ophthalmic Dept. and Inst. of Aviation Med., Warsaw, Poland).
American Journal of Ophthalmology, vol. 64, Nov. 1967, p. 965–968. 6 refs.

Venous pressure was increased with glaucoma by means of pressure breathing at 200 mm. H_2O for periods of six min. This caused an increase in intraocular pressure which continued as long as the increased venous pressure persisted. The increased venous pressure did not cause acute angle-closure glaucoma. The intraocular pressure during pressure breathing did not differ significantly between patients with glaucoma and healthy subjects.

A68-80132
INTRAOCULAR PRESSURE DURING PRESSURE BREATHING. I. HEALTHY ADULTS.
Pawel Segal, Lech Gebicki, Stanislaw Janiszewski, and Janina Skwierczyńska (WAM School of Med., III Dept. of Internal Med. and Ophthalmic Dept. and Inst. of Aviation Med., Warsaw, Poland).
American Journal of Ophthalmology, vol. 64, Nov. 1967, p. 956–964. 22 refs.

By means of an apparatus employed in aviation, pressure breathing of about 15–30 mm. Hg was developed. Eighty-four healthy men in different age groups were examined. An increase of venous pressure followed by rise of intraocular pressure was observed. These artificially induced pressure rises were maintained for eight to 15 min.

A68-80133
EFFECT OF SQUATTING ON THE RESPIRATORY FUNCTION IN NORMAL SUBJECTS AND IN PATIENTS WITH CHRONIC BRONCHITIS AND EMPHYSEMA.
J. Benbassat and J. J. Groen (Hadassah U. Hosp., Dept. of Med. A, and Hebrew U.–Hadassah Med. School, Jerusalem, Israel).
Israel Journal of Medical Sciences, vol. 3, Jul.–Aug. 1967, p. 549–552. 12 refs.
Lasker Found. for Study of Man and Found. for Sci. Cooperation, Netherlands and Israel.

A shift from a standing or sitting position to one of squatting produces a diminution in the vital capacity, mainly because of a reduction in the expiratory reserve volume, and an increase in the respiration rate. These changes, which may be interpreted as an impairment of the respiratory functional reserve, are most marked in overweight subjects. The possibility of a causal relationship between the habit of squatting and the prevalence of chronic bronchitis is discussed.

A68-80134
ALTITUDE EFFECTS ON THE HUMAN BODY. PART II.
Gene W. Mason (Providence Hosp., Dept. of Anesthesiol., Everett, Wash.)
Northwest Medicine, vol. 66, Nov. 1967, p. 1032–1035.

A review and discussion is presented on human reactions to ultraviolet radiation and low pressure. Individual variation and photosensitizing action of drugs are mentioned. Personal experiences during mountain climbing are related in relation to low barometric pressure and hypoxia, including some interesting accounts of hallucinations while descending from high altitude.

A68-80135
EFFECT OF HIGH AMBIENT AIR TEMPERATURE ON THE COURSE OF THIOL POISONING [VLIIANIE VYSOKOI TEMPERATURY VOZDUSHNOI SREDY NA TECHENIE INTOKSIKATSII TIOLOVYMI IADAMI].
I. V. Savitskii (Med. Inst., Kiev, UkrSSR).
Gigiena Truda i Professional'nye Zabolevaniia, no. 10, Oct. 1967, p. 30–35. 15 refs. In Russian.

Experiments showed that a chronic action of thiol poisons, irrespective of the route of their entry into the organism, increased considerably when accompanied by temperatures in excess of 30°C. The intensified toxic effect following a combined action of chemical and thermal factors manifested itself in a greater weight loss, changed weight proportions of internal organs, modifications in the morphological composition of the peripheral blood, modification in the level of sulfhydryl groups in the blood and tissues of the organism and a higher death rate. In terms of lethality and other indicators, the toxic effect in the combined action of these two factors increased 1.1 to 4 times, testifying to an interpotentiating action of the combinations under discussion. The data suggested that new, reduced standards of maximally permissible concentrations of thiol poisons should be set up for industrial premises with thermally elevated microclimates. In such instances it was suggested that the permissible concentration of a given thiol poison be reduced by half as against the stipulated sanitary standards CH-245-63.

A68-80136
UNIFICATION OF PHYSICAL INVESTIGATION METHODS IN THE STUDY OF THE EFFECT PRODUCED BY NOISE ON THE HUMAN ORGANISM [OB UNIFIKATSII METODOV FIZIOLOGICHESKIKH ISSLEDOVANII PRI IZUCHENII DEISTVIIA SHUMA NA ORGANIZM CHELOVEKA].
E. TS. Andreeva-Galanina, S. V. Alekseev, and A. V. Kadyskin. (Sanit.-Hyg. Med. Inst., Leningrad, USSR).
Gigiena Truda i Professional'nye Zabolevaniia, no. 10, Oct. 1967, p. 14–18. 27 refs. In Russian.

Some suggestions relative to the unification of the most commonly used methods of investigation and conditions required in the study of the effect produced by noise on the organism were presented. Since noise pathology has shown that noise affects the

entire organism, methods calling for functional investigations of the central nervous system, acoustic analyzer and the cardiovascular system have become popular. The authors made a number of suggestions as to the justification for using the procedures adopted along with certain conditions to be used in the study of the visual and acoustic motor reactions, audiometry, determination of the critical frequency of sound oscillations, etc.

A68-80137

DRYING OF FOOD, IN PARTICULAR FREEZE-DRYING AND ITS SIGNIFICANCE FOR MILITARY COMBAT RATIONS [UBER DIE LEBENSMITTELTROCKNUNG, BESONDERS DIE GEFRIERTROCKNUNG, UND IHRE BEDEUTUNG FUR DIE MILITARISCHE EINSATZVERPFLEGUNG].

Karl Herrmann.

Wehrmedizin, vol. 5, no. 10, 1967, p. 191–198. In German.

Dried products have an important advantage for military logistics of retaining their same nutritive value and are considerably reduced in both weight and volume. They can be stored better than other food stuffs at higher or changing temperatures. The drying of plant products, e.g., vegetables, and of liquids, such as milk, coffee and fruit juices is guaranteed today with a good quality being maintained. Freeze-dried ahimal products are important for military combat rations and are introduced in modern armies. The author also deals with the freeze-drying of fruit and vegetables and briefly reviews developmental work concerning the technical improvement of freeze-drying.

A68-80138

THYROCALCITONIN, OSTEOPOROSIS AND OSTEOLYSIS.

Howard Rasmussen and Alan Tenenhouse (Pa. U., School of Med., Dept. of Biochem., Philadelphia).

American Journal of Medicine, vol. 43, Nov. 1967, p. 711–726. 64 refs.

Grants NIH AM 09650-02 and LIMRF G-66-52.

This review considers the problem of osteoporosis in the context of present knowledge (and its limitations) of the mechanisms of bone resorption and bone formation. Two particular points are emphasized: (1) osteoporosis is a disorder characterized by an imbalance between formation and resorption in favor of the latter; and (2) both bone formation and resorption are regulated by the local ionic environment as well as the activities of several hormones. A rational therapy for this condition will undoubtedly have to take account of both processes and of means of enhancing the one (formation) and suppressing the other (resorption). In the latter context, thyrocalcitonin has already been shown to have a profound effect in experimental animals, but one disturbing feature of its action is the very striking decrease in its effectiveness in older animals. Whether or not this will be a major limitation to its use in adult human subjects remains to be established. Also considered is the recent evidence that thyrocalcitonin and parathyroid hormone control metabolism by regulating the fluxes of calcium and magnesium across cellular and subcellular membranes as well as the activities of enzymes whose functions are controlled by these cations. Specific attention is directed to the effects of these hormones upon the activity of pyrophosphatase, an enzyme specifically implicated in bone metabolism.

A68-80139

REGULATION OF BONE RESORPTION AND FORMATION. INFLUENCES OF THYROCALCITONIN, PARATHYROID HORMONE, NEUTRAL PHOSPHATE AND VITAMIN D_3.

Maurice M. Pechet, Eduardo Bobadilla, Evelyn L. Carroll, and Robert H. Hesse (Mass. Gen. Hosp., Boston and Res. Inst. for Med. and Chem., Cambridge).

American Journal of Medicine, vol. 43, Nov. 1967, p. 696–709. 30 refs.

Grants PHS A-1156 and PHS AM-4051.

The destruction of bone collagen and dissolution of bone mineral induced by parathyroid hormone administration is accompanied by a concomitant renal action of the hormone, causing decreased tubular reabsorption of phosphorus and increased reabsorption of calcium and magnesium. The hormone also acts on soft tissue cells, resulting in a shift of phosphorus, potassium and magnesium from cells. Thyrocalcitonin inhibits bone resorption and the action of parathyroid hormone on bone resorption and may also stimulate osteoblastic activity. The effect of thyrocalcitonin on phosphorus excretion is influenced by the ratio of calcium to magnesium cations perfusing the kidney. Minimal amounts of parathyroid hormone are required for the action of vitamin D_3 upon bone, and bone resorption induced by the vitamin is suppressed by thyrocalcitonin. Since the hormone is required for the action of the vitamin on bone, cases of hypoparathyroidism resistant to vitamin D may respond to treatment with the combination of vitamin plus hormone. Although thyrocalcitonin protects against hypercalcemia, the physiologic significance of this is unknown. Another important function of the hormone may be in the regulation of bone remodeling. Administration of neutral phosphate stimulates bone formation and bone mineralization. A combination of neutral phosphate with thyrocalcitonin may prove to be useful in the treatment of osteoporosis.

A68-80140

OPPORTUNITIES OF LARGE-FRAME PHOTOFLUOROGRAPHY IN THE X-RAY DIAGNOSIS OF VIBRATION-INDUCED DAMAGES OF THE OSTEOARTICULAR SYSTEM [VOZMOZHNOSTI KRUPNOKADROVOI FLIUOROGRAFII V RENTGENODIAGNOSTIKE VIBRATSIONNYKH PORAZHENII KOSTNO-SUSTAVNOI SISTEMY].

IU. R. Mamontov (Sanit.-Hyg. Med. Inst., Leningrad, USSR).

Gigiena Truda i Professional'nye Zabolevaniia, no. 8, Aug. 1967, p. 29–32. 13 refs. In Russian.

When examining 100 foundry trimmers and 150 concrete placers the author made use of large-frame photofluorography in order to detect degenerative-dystrophic alterations in the osteoarticular system of operators in the vibration-exposed occupations. Investigations proved that on large-frame fluorograms, with the frame measuring 90×90 mm., the phenomena of osteoporosis, enostosis, cystose formations, spondylitis deformans, etc., could be discerned as precisely as on ordinary X-ray films. On the other hand, fluorograms with the frame measuring 70×70 mm. failed to distinctly demonstrate bony elements whose natural size was less than 2 mm. The method of large-frame photofluorography may be recommended for performing special-purpose examinations of workers engaged in occupations involving vibration hazards, to reveal degenerative-dystrophic processes in their osteo-articular system.

A68-80141

BASIC FUNCTIONS OF THE STOMACH IN PATIENTS WITH VIBRATION DISEASE [SOSTOIANIE OSNOVNYKH FUNKTSII ZHELUDKA U BOL'NYKH VIBRATSIONNOI BOLEZN'IU].

A. I. Kleiner (Inst. Hyg., Labor, and Prof. Diseases, Kharkov, USSR).

Gigiena Truda i Professional'nye Zabolevaniia, no. 8, Aug. 1967, p. 25–28. 27 refs. In Russian.

Basic gastric functions (secretory, acidogenic, enzyme-producing, motor-evaccuant and excretory) were studied in 91 patients suffering from vibration disease, whose origin was due to the effect of a median-frequency "local" vibration (metal-chippers, emery-grinders, fitters). The functional state of the stomach was characterized by inhibited secretion, especially in the complex-reflex phase of digestion (in 49% of cases); by the emergence of marginal motoricity types (in 30% of cases) and the absence

of any noticeable morphological changes. A correlation between the revealed shifts, on the one hand, and the specific service record, as well as the degree of vibration disease, on the other, could be noted, thus emphasizing the importance of recording the condition of digestive organs during recurrent medical examinations.

A68-80142
ALTERATIONS IN GASSERIAN GANGLIONS AND IN THE ORAL CAVITY FOLLOWING LEAD AND MERCURY POISONING [IZMENENIIA V GASSEROVYKH UZLAKH I POLOSTI RTA PRI EKSPERIMENTAL'NOI SVINTSOVOI I RTUTNOI INTOKSIKATSII].

V. I. Shevchenko and M. S. Tolgskaia (USSR, Acad. of Med. Sci., Inst. of Hyg., Labor, and Prof. Diseases, Moscow).

Gigiena Truda i Professional'nye Zabolevaniia, no. 10, Oct. 1967, p. 35–38. refs. In Russian.

Pathomorphological alterations in Gasserian ganglia occurring simultaneously with those in the oral cavity after experimental lead and mercury poisoning were studied. Severe disseminated dystrophic changes in both Gasserian ganglia resulted from the poisoning. The intensity of the changes was dependent on the degree and duration of lead and mercury poisoning. Alterations in Gasserian ganglia were more marked by changes in interganglionic conduction paths and in initial portions of the tregiminal nerve branches from lead poisoning than from mercury poisoning. There was a definite relationship between lesion of the nerve elements in Gasserian ganglia and pathological alterations in the oral cavity. Besides the local action of lead and mercury discharged by the buccal mucosa, deranged trophicity, lined with affection of Gasserian ganglia may be of importance in the production of alterations in the oral cavity.

A68-80143
ROENTGENOLIGIC AND HISTOLOGIC CHANGES IN BONE PRODUCED BY THYROCALCITONIN.

Giruad V. Foster, Frank H. Doyle (Roy. Postgraduate Med. School, Dept. of Chem. Pathol. and Diagn. Radiol. and Hammersmith Hosp., London, Great Britain), Philippe Bordier, Haydée Matrajt, and S. Tun-Chot (Centre du Metab. Phosphocalcique, Hop. Lariboisiere, Paris, France).

American Journal of Medicine, vol. 43, Nov. 1967, p. 691–965. 15 refs.
AHA and MRC supported research.

Investigations indicated that thyrocalcitonin increases metaphyseal bone mineral and reduces the number of osteoclasts in the affected area. The increase in fully mineralized metaphyseal bone is associated with an increase in partially mineralized and unmineralized osteroid. Thyrocalcitonin unquestionably inhibits bone resorption. In addition it either increases the rate of bone formation, reduces the rate of bone mineralization or interferes with the resorptive phase of unmineralized collagen turnover. The conclusions were based on studies in parathyroidectomized animals. Presumably similar changes could be induced in intact animals given larger and more frequent doses of hormone for longer periods. In the dosage used in intact animals, the effects of thyrocalcitonin were most likely obscured by a compensatory increase in parathyroid hormone secretion.

A68-80144
THYROCALCITONIN AND BONE RESORPTION.

Lawrence G. Raisz, William Y. W. Au, Judith Friedman, and Ingrid Niemann (Rochester U., School of Med. and Dentistry, Depts. of Pharmacol. and Med., N. Y.)

American Journal of Medicine, vol. 43, Nov. 1967, p. 684–690. 14 refs.
Grant PHS AM 06205.

Thyrocalcitonin, partially purified from rat thyroid glands, was a potent inhibitor of resorption in tissue cultures of fetal rat bone. The ability of thyrocalcitonin to block bone resorption stimulated by parathyroid hormone in tissue culture has provided a sensitive, specific and reproducible bioassay which can be used to detect thyrocalcitonin-like activity in serum. The results of this bioassay indicate that the serum of thyroid-intact rats contains an inhibitor of bone resorption which appears after a hypercalcemic stress. The amount of thyrocalcitonin activity was similar in parathyroidectomized rats, which required injections of large amounts of calcium to increase their serum calcium concentration from low to hypercalcemic values, and rats with parathyroid transplants which required only small amounts of calcium to increase their serum hypercalcemic values. Thyrocalcitonin-like activity could not be demonstrated in the serum in the absence of a calcium stress. Prolonged administration of thyrocalcitonin in tissue culture results in an escape of the bone from its inhibitory effect and the resumption of active bone resorption in the presence of parathyroid hormone and thyrocalcitonin. This escape phenomenon was due to the continuous presence of partially purified thyrocalcitonin and not to any changes in the cells during tissue culture or to the presence of parathyroid hormone. The data supported the hypothesis that thyrocalcitonin is an emergency hormone secreted only intermittently in response to hypercalcemic stress. Its action is to inhibit bone resorption, resulting in a decrease in the movement of calcium from bone to blood and a lower serum calcium concentration.

A68-80145
DISCOVERY AND PHARMACOLOGIC EVALUATION OF THYROCALCITONIN.

Paul L. Munson and Philip F. Hirsch (N. C. U., School of Med., Dept. of Pharmacol., Chapel Hill).

American Journal of Medicine, vol. 43, Nov. 1967, p. 678–683. 17 refs.
Grants PHS AM-8261, PHS AM-10558, and PHS 1 SO 1 FR 5406-04-6; Merck, Sharp and Dohme supported research.

The discovery of thyrocalcitonin grew out of an investigation of the greater fall of serum calcium levels in rats after parathyroidectomy by hot wire cautery than by surgical excision. It was found that the differential effect could be explained by a cautery-stimulated release of a hypocalcemic substance (thyrocalcitonin) from the thyroid gland into the circulation. A bioassay method used to monitor steps in the purification procedure helped to make possible the recent isolation of pig thyrocalcitonin as a homogeneous polypeptide. This method is based on the extent of hypocalcemia produced in calcium-depleted, young intact Holtzman rats one hr. after subcutaneous injection of test preparations. The method was substantially improved in precision and convenience by feeding the rats the Harvard low calcium diet for only one day instead of four days before the assay and by using rats five wk. rather than six and a half wk. of age. Feeding the Harvard low calcium diet, adequate in phosphate, for one day was found to be superior to fasting or use of a commercial diet low in both calcium and phosphate. Injection of inorganic phosphate greatly enhanced the hypocalcemic effect of thyrocalcitonin in fasted rats. In strains of rats relatively less responsive to rat and pig thyrocalcitonin, the thyrocalcitonin content of the thyroid glands was higher than in the more responsive Holtzman rats. Older rats were found to be less responsive to injected thyrocalcitonin than younger rats. Thyrocalcitonin and parathyroid hormone are antagonistic in their effects on plasma calcium. Thyrocalcitonin is active in the absence of parathyroid hormone and its effect is not dependent on the presence of the pituitary gland, kidney or gastrointestinal tract. It acts directly on bone *in vitro* to inhibit resorption. In the absence of the thyroid gland, recovery from induced hypercalcemia is slower than normal, and this deficiency can be corrected by administration of thyrocalcitonin. However, a

more important function of thyrocalcitonin in normal physiology than protection against hypercalcemia may be its role in the development and maintenance of the skeleton.

A68-80146
FREE RADICALS INDUCED IN ENZYMES BY ELECTRONS AND HEAVY IONS.
Thormod Henriksen (Calif. U., Lawrence Radiation Lab., Berkeley and Norsk Hydro's Inst. for Cancer Res., Mobtebello, Norway).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 87–101. 15 refs.
NASA and AEC supported research.

The free radicals produced in the three enzymes ribonuclease, lysozyme and trypsin, exposed to various types of ionizing radiations, have been studied by electron spin resonance spectroscopy. The enzymes were irradiated in the solid state, in vacuum, at different temperatures in the range 77° to 330°K. For all three enzymes it was found that the resonance spectra at room temperature can be ascribed mainly to sulfur radicals and to a radical in which the unpaired electron is localized on an α-carbon atom in the protein backbone. However, for all three enzymes another unidentified resonance was found. The resonance is spread out over about 70 gauss, is centered at a g value approximately that of the free electron, and is more unstable than the two other secondary radicals. The yield of secondary enzyme radicals increases with increasing ambient irradiation temperature. The temperature effect depends on the type of radiation and is larger when the stopping power is smaller. A plot of the radical yield versus the irradiation temperature can be described by a sum of exponential functions. One possible interpretation is that the secondary enzyme radicals are produced by several processes with activation energies from zero to approximately 7 kcal./mole. A good correlation was found between the production of secondary radicals and the inactivation of the three enzymes.

A68-80147
ELECTRON SPIN RESONANCE STUDIES ON PROTON-IRRADIATED RIBONUCLEASE AND LYSOZYME.
K. Stratton (Mass. Gen. Hosp., Physics Res. Lab., Boston).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 102–115. 20 refs.
NASA and Am. Cancer Soc. supported research.

The long-lived radicals produced in crystalline ribonuclease and lysozyme by 120-MeV. proton, Bragg peak proton, and ^{60}Co gamma irradiation were studied by electron spin resonance (ESR) spectroscopy. The proton irradiations did not produce any resonance spectra markedly different from those obtained after ^{60}Co irradiation at the same temperature. However, higher linear energy transfer radiation ($\bar{E} \approx 300$-KeV. neutrons) at 77°K. did give rise to a different spectrum. The efficiency of production of long-lived radicals in these enzymes by Bragg peak protons relative to ^{60}Co gammas was 0.85 ± 0.02, but there was some dose-rate dependence, especially for lysozyme. Raising the temperature from 77°K. to 298°K. caused about 20% reduction in the total number of radicals remaining, but irradiation at 298°K. gave similar or greater radical yields than at 77°K. Saturation of the radical concentration occurred for high doses, both at 77°K. and at room temperature, *in vacuo* and in air. The radical saturation levels in air were lower by a factor of about 3 than in vacuum. The secondary processes giving rise to sulfur-type radicals have been observed in annealing studies. Change due to the presence of oxygen during or after irradiation were found to be greater for ribonuclease than for lysozyme. No sulfur radicals were detected in ribonuclease after irradiation in air, but sulfur radicals already present after irradiation *in vacuo* were relatively stable to later admission of oxygen.

A68-80148
A MORTALITY DETERMINANT IN NONUNIFORM EXPOSURES OF THE MAMMAL.
V. P. Bond and C. V. Robinson (Brookhaven Natl. Lab., Med. Res. Center, Upton, N. Y.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 265–275. 12 refs.
AEC supported research.

A model to deal with the problem of evaluating the effects of nonuniform dose distribution in animals exposed to penetrating radiation in the $LD_{50(30)}$ (hematological syndrome) range is developed and tested on the basis of available data in the literature. The model takes into account the absorbed dose to subunits of bone marrow, the distribution of bone marrow (stem cells) in the body, and presumed exponential nature of the dose-survival curve for bone marrow stem cells. The surviving fractions of stem cells in the entire body, as calculated on the basis of the model and from available mortality data, are approximately the same at the $LD_{50(30)}$ for uniform and nonuniform exposure. A basis for a distribution effectiveness factor (DEF) to take into account differences in macrodistribution of dose, similar in concept to the relative biological effectiveness factor (RBE) that takes into account differences in microdistribution in dose, is presented.

A68-80149
THE INTERPRETATION OF MICROBEAM EXPERIMENTS FOR MANNED SPACE FLIGHT.
Howard J. Curtis (Brookhaven Natl. Lab., Biol. Dept., Upton, N. Y.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965)
Radiation Research, Suppl. 7, 1967, p. 258–264. 6 refs.
AEC supported research.

Previously reported work with a deuteron microbeam, which simulates the biological action of heavy particles, has shown (1) that the brain is very insensitive to this type of radiation, (2) that the epithelial cells of the lens of the eye are quite sensitive, but it takes more than a very few abnormal cells to form a cataract, and (3) that the hair follicles are quite sensitive, and a relatively small dose will cause the hair from an irradiated follicle to turn gray. These results are quite in accord with modern concepts in radiobiology which have been deduced from many different kinds of experiments. From these considerations one can estimate the effect of these particles on other organs of the body. It is then possible to predict with considerable confidence from the known fluxes that the heavy cosmic-ray particles will not constitute an appreciable hazard for space flights of some months duration.

A68-80150
THE USE OF A DEUTERON MICROBEAM FOR SIMULATING THE BIOLOGICAL EFFECTS OF HEAVY COSMIC-RAY PARTICLES.
Howard J. Curtis (Brookhaven Natl. Lab., Biol. Dept., Upton, N. Y.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965)
Radiation Research, Suppl. 7, 1967, p. 250–257. 7 refs.
AEC supported research.

The ionization produced by heavy cosmic-ray particles is almost entirely highly concentrated along single tracks, and the microscopic dose within these tracks is very high, although the overall dose rate in outer space would be very low. These particles cannot be produced now in the laboratory, so a microbeam of deuterons has been developed which simulates the ionization patterns of these particles. When this microbeam is used on mice, it is found that this type of radiation causes very little damage in the brain or eye and presumably in the other vital organs of the body.

However, it does cause graying of hair. It is concluded that this type of radiation will not constitute a serious hazard for space flight.

A68-80151
LENS OPACIFICATION IN MICE EXPOSED TO FAST NEUTRONS.
John L. Bateman and Victor P. Bond (Brookhaven Natl. Lab., Med. Res. Center, Upton, N. Y.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 239–249.
Grant PHS RH 00099-05 and AEC supported research.

Early minute lens opacities were examined periodically after the exposure of mice to low and intermediate doses of fast neutrons at either of two discrete energies, or to 250-kVp. X-rays. Data were gathered and analyzed by revised techniques. The anterior and posterior regions of the lens were considered as two separate systems. Results in each region suggested an approximate cataractogenic efficiency of 10 for neutrons of either 0.43 MeV. or 1.80 MeV., as compared to 250-kVp. X-rays. Neutron doses of 1 rad appeared to produce definite opacification, which however, reached a plateau not seen with higher radiation doses. Further relative biological effectiveness analysis and subsequent histological study will be carried out.

A68-80152
RECOVERY OF YEAST AFTER EXPOSURE TO DENSELY IONIZING RADIATION.
J. T. Lyman and R. H. Haynes (Calif. U., Lawrence Radiation Lab., Berkeley).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 222–230. 23 refs.
Contract AEC W-7405-eng-48.

A great enhancement of viability is observed if nonnutritive suspensions of diploid yeast, which have been irradiated with X-rays or heavy ions (^{4}He, ^{12}C, ^{20}Ne), are stored at 30°C. in the dark for four or more hours prior to plating. Maximum recovery is usually observed after 24 to 48 hr.; the survival curves obtained on delayed plating are related to those for immediate plating by a constant dose-modifying factor. Several lines of evidence indicate that recovery is based on enzymic postirradiation processes unrelated to the initial physicochemical reactions associated with absorption of the radiation. The magnitude of recovery is independent of such radiobiological modifiers as oxygen or glycerol, or track ion density. All these modifiers are thought to act by affecting the nature and distribution of the products of the initial radiochemical reactions. Thus, the recovery appears to be substantially independent of the precise chemical nature of the radiation-induced lesions. Very severe macromolecular damage is likely to be produced by the densely ionizing radiations. The ability of diploid yeast to recover after such irradiation suggests that a "bypass" rather than a direct repair mechanism may be involved. Segregation of the damage by sporulation would appear to be, a priori, a suitable bypass mechanism, but this hypothesis is ruled out by the results cited in this paper.

A68-80153
HEAVY-ION IRRADIATION OF CULTURED HUMAN CELLS.
Paul Todd (Calif. U., Donner Lab., Berkeley).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 196–207. 26 refs.
NASA and AEC supported research.

Some aspects of the radiosensitivity of single human cells were examined *in vitro*. So far, all factors that tend to modify sensitivity to X-radiation appear not to modify (or to modify less effectively) the effect on single cells of high-dE/dx radiation. Whenever the hazards of heavily ionizing radiations are being evaluated, chronic exposure must be considered equivalent to acute exposure, and any attempts to modify the effects of densely ionizing radiations at the cellular level are probably useless. In the case of cultured human cells, the relative biological effectiveness (RBE) is dependent on the end point because of the differently shaped survival curves. Thus, for example, the RBE of fast carbon ions for 50% survival is about six, whereas it is only about two for 1% survival. The applicability of these findings to the evaluation of the hazards of particulate radiation await further understanding of the sequelae of the inhibition of cellular reproduction.

A68-80154
INDUCTION OF DIFFERENT CLASSES OF GENETIC EFFECTS IN YEAST USING HEAVY IONS.
S. Nakai and R. Mortimer (Calif. U., Donner Lab., Berkeley).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 172–181. 16 refs.
NASA, AEC and Calif. Cancer Grant supported research.

Results are presented on the induction of a number of classes of genetic effects using radiations of different total linear energy transfer (LET). The main points emphasized are: 1. For all effects studied—lethality, dominant lethality, mitotic segregation, allelic recombination and reverse mutation—densely ionizing particles are more efficient than sparsely ionizing radiation. The maximum efficiency occurs in the LET_{∞} region corresponding to 10 MeV./nucleon boron or carbon nuclei. Differences in the relation between relative biological effectiveness (RBE) and LET_{∞} occur for the various effects, particularly in the height of the maximum and the slope with which the RBE decreases with LET_{∞} values higher than the LET_{∞} of maximum effectiveness. With respect to these differences, haploid inactivation and mutation appear to be in one class, while diploid inactivation, dominant lethality, mitotic crossing-over, and allelic recombination are in another class. This might indicate differences in the molecular mechanism of induction of these effects. 2. No pronounced differential effects of heavy compared to light ions were apparent for the induction of mitotic recombination in different intergenic or intragenic regions even though the relative dimensions differ by two orders of magnitude. The above findings are most easily explained by assuming that the nature and size of the targets for effects at different levels within the chromosome are similar, or that the effects are mediated by a common diffusible intermediate.

A68-80155
INACTIVATION OF RIBONUCLEASE BY ELASTIC NUCLEAR COLLISIONS.
Horst Jung (Nucl. Res. Center, Inst. for Radiation Biol., Karlsruhe, West Germany).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 64–73. 26 refs.

Extremely thin layers of ribonuclease were irradiated with slow protons, and the differential inactivation cross section was determined for various proton energies in the range from 0.8 to 60 keV. At higher proton energies the inactivation cross section is not strongly dependent on energy. With decreasing proton energy, however, it decreases rapidly, reaches a sharp minimum at 1.2 keV., and increases again at still smaller energies. By comparing the experimentally determined inactivation cross sections with the cross sections for energy losses in elastic nuclear collisions and in ionizations, elastic collisions were demonstrated to destroy, in fact, the enzymatic activity of ribonuclease. The energy required for an

inactivation by nuclear collisions is only one fourth of the energy necessary for an inactivation by ionization.

A68-80156
DOSIMETRY OF PROTON BEAMS USING SMALL SILICON DIODES.

A. M. Koehler (Harvard U., Cyclotron Lab., Cambridge, Mass.)

(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 53–63. 7 refs.
NASA Grant NsG 262-63.

Silicon diodes intended for electronic applications were tested as radiation dosimeters on proton beams. Effects of dose rate, measuring circuit impedance, radiation damage, and proton energy were investigated. The small size of the diodes makes them nearly ideal for exploring the depth-dose distribution of small well-collimated beams. A measuring circuit of sufficiently low input impedance must be used. Pre-exposure to massive doses of radiation virtually eliminates change in sensitivity during subsequent measurements at lower intensities. Response is adequately independent of proton energy for many applications, although an unexplained discrepancy with nitrogen ion chamber measurements exists.

A68-80157
INACTIVATION AT VARIOUS TEMPERATURES OF THE ESTERASE ACTIVITY OF DRIED TRYPSIN BY RADIATIONS OF DIFFERENT LET.

Tor Brustad (Norsk Hydro's Inst. for Cancer Res., Montebello, Norway).

(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 74–86. 24 refs.
NASA, AEC, and Norsk Hydro's Inst. for Cancer Res. supported research.

Inactivation by heavy ions of the esterase activity of dried trypsin has been studied as a function of the temperature of the samples during irradiation (10°K to 430°K). The LET range from 45 MeV.–cm^2/g. to about 13,000 MeV.–cm^2/g. was investigated by using stripped nuclei of argon, neon, carbon, boron, helium, and deuterium. For all radiations used, the radiosensitivity was found to be essentially constant when the exposure was carried out at temperatures below about 100°K. When irradiation was performed at higher temperatures the radiosensitivity increased with increasing temperature, but this increase was less pronounced when radiation of high LET was used. These effects are observed only if the samples are subjected to heat and radiation simultaneously.

A68-80158
STUDIES OF VICIA FABA ROOT MERISTEMS IRRADIATED WITH A π^- BEAM.

Stephen P. Richman, Chaim Richman, Mudundi R. Raju, and Bernard Schwartz (Calif. U., Lawrence Radiation Lab., Donner Lab., Berkeley).

(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 182–189. 7 refs.
AEC and Am. Cancer Soc. supported research.

Vicia faba root meristems were exposed to pion irradiation in the flat or plateau region and in the peak or star region of the π^--meson "Bragg curve." The percentages of total anaphases observed to be abnormal at various intervals after the end of the irradiation, the percentage of cells containing micronuclei was scored at similar intervals, and the growth rate following irradiation was measured as a fraction of the control rate. All three measurements indicated that a significantly greater amount of damage was received from irradiation in the Bragg peak than from irradiation in the Bragg plateau for the same period of total exposure. Although these data leave many questions unanswered, the results are encouraging. About half of the dose in the Bragg plateau is due to contamination. When this is removed with an electrostatic separator, a much clearer picture of the effects of pions will be possible. In addition, the heavily ionizing particles in the star, particularly the α particles, are known to exhibit little or no oxygen effect. Of interest, then, will be the irradiations in which the water in the boxes has been wholly or partially deoxygenated.

A68-80159
RELATIVE BIOLOGICAL EFFECTIVENESS OF DIFFERENT TYPES OF IONIZING RADIATIONS: CYTOGENETIC EFFECTS IN MAIZE.

Harold H. Smith (Brookhaven Natl. Lab., Biol. Dept., Upton, N. Y.)

(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 190–195. 8 refs.
AEC supported research.

The frequency of yg_2 events in leaves grown from irradiated Yg_2/yg_2 maize seeds shows an essentially linear response to dose. Compared with 250-kVp.-X-rays, the approximate relative biological effectiveness (RBE) of monoenergetic neutrons (0.43 to 14.7 MeV.) is between 50 and 100, of muons (7 GeV.) 0.76, of π-mesons (8 GeV.) 3.2, and of protons (28 GeV.) 4.4. These results were considered in terms of dose average linear energy transfer (LET) and whether or not nuclear interactions take place. Application of microdosimetric concepts to this system indicates that the interphase chromosome is broken, to cause a yg_2' sector, when a single charged particle delivers an energy of approximately 93 keV. or more to a spherical region of the cell nucleus that is approximately 1 micron in diameter but proportional to nuclear size.

A68-80160
SURVIVAL, CHROMOSOME ABNORMALITIES, AND RECOVERY IN HEAVY-ION- AND X-IRRADIATED MAMMALIAN CELLS.

L. D. Skarsgard, B. A. Kihlman, L. Parker, C. M. Pujara, and S. Richardson (Yale U., Depts. of Mol. Biophysics and Radiol., New Haven, Conn.)

(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 208–221. 24 refs.
Grants AEC AT (30-1-2653) and PHS CA 06519-03.

Results are presented for survival of colony-forming ability, chromosome damage, and recovery between two dose fractions for a wide range of accelerated heavy ions and for X-rays. The dependence of the dose response on linear energy transfer (LET_∞) was found to be very similar for colony-forming ability (as judged the final slope of the survival curve) and chromosome damage, supporting the hypothesis that the radiosensitive sites are the same for these two effects. The survival curves for heavy ions demonstrated a small but significant shoulder, persisting at least to an LET_∞ of 1,890 MeV.–cm.^{2}/g., indicating the presence of accumulated sublethal damage at these high ionization densities. The recovery data showed that up to an LET_∞ of 443 MeV.–cm.^{2}/g. some of this damage, at least, is reversible. The damage becomes irreversible, however, somewhere in the LET_∞ region between 400 and 1,300 MeV.–cm^2/g.

A68-80161
EFFECTS OF SONIC IRRADIATION ON YEAST.

V. W. Burns (Calif. U., Dept. of Physiol. Sci., Davis).

(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 231–238. 13 refs.
Grant PHS AM-09432.

Under certain conditions sublethal sonic irradiation will prevent accumulation of ureidosuccinate (US) in the yeast S 1237 during irradiation. On termination of sonication US again accumulates at a normal rate. Under identical irradiation conditions free histidine leaks out of the cells and protein synthesis declines; these effects are not immediately reversed on termination of sonication. The same treatment does not affect the uptake and incorporation of adenine or the pool of purine nucleotides. The uptake and/or retention of asparate, a precursor of ureidosuccinate, is reduced by sonic irradiation. The simplest explanation consistent with these facts and those presented in an earlier paper is that the cell membrane may become more permeable to certain small molecules during sonic irradiation. At a certain critical intensity of sound some kinds of small molecules may leak out of the cell; other kinds and large molecules cannot. The passage of molecules into the cell may also be affected. The time required to return to normal behavior after irradiation seems to depend on the molecular species or process affected.

A68-80162
KINETICS OF INJURY AND REPAIR TO MAMMALIAN TISSUE BY HIGH-LET RADIATION.
J. F. Fowler (Hammersmith Hosp., Postgraduate Med. School, London, Great Britain).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 276–287. 17 refs.

The short-term intracellular recovery from sublethal injury, occurring within one cell cycle, has been shown in a number of cell systems to decrease with increasing LET_∞ (total particles) of the radiation. It is suggested that this is due to the increasing proportion of single-hit (=single-track) killing with increase of LET_∞. Experiments are described on the skin of mice irradiated with single or divided doses of fast neutrons, or with X-rays or electrons. For fast neutrons generated by 15-MeV. deuterons on beryllium (maximum energy 18 MeV., modal energy 6 MeV.), this intracellular recovery is about one-half to two-thirds as great as for a dose of X-rays producing the same cell killing. The rate of appearance and subsequent healing of acute skin reactions has been studied, as a measure of cellular repopulation rate. It is demonstrated that there is no significant difference in these rates after fast neutron or X-irradiation.

A68-80163
INJURY ACCUMULATION AND RECOVERY IN SHEEP DURING PROTRACTED GAMMA IRRADIATION.
G. F. Leong, N. P. Page, E. J. Ainsworth, and G. E. Hanks (U.S. Naval Radiol. Defense Lab., San Francisco, Calif.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 288–293. 11 refs.

Since the LD_{50}, the mean survival time, size and body dimensions for sheep approximate those of man, studies with sheep were extended for the purpose of evaluating hazards encountered following protracted irradiation exposure. In order to describe injury accumulation and recovery processes, the sheep were exposed to ^{60}Co γ rays at dose rates of 0.5 to 3.9 r/hr. Other sheep were acutely irradiated for determination of the LD_{50}. The data showed that, under protracted exposure conditions, a threshold exposure rate for injury accumulation (between 1.0 and 1.85 r/hr.) exists and at an exposure rate of 3.6 r/hr., injury accumulates linearly with the total dose. The results also showed that, while the recovery process had certain regularities, it was far from a simple exponential. Because of transient changes in radiosensitivity for a number of species after radiation exposure, the recovery rate for mammalian species cannot be described by a single rate constant.

A68-80164
GENETIC EFFECTS OF HIGH-LET RADIATIONS IN MICE.
A. G. Searle and Rita J. S. Phillips (Med. Res. Council Radiobiol. Res. Unit, Harwell, Berkshire, Great Britain).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 0965).
Radiation Research, Suppl. 7, 1967, p. 294–303. 23 refs.

Two experiments are described in which hybrid male mice were exposed to various doses and intensities of fast neutron irradiation (mean energy 0.7 MeV.), as well as to cobalt-60 γ irradiation, and spermatogonial mutation rates were by use of the specific locus method. The dose-mutation relationship appears to be linear with chronic neutron exposures, and at low intensities the neutron-γ RBE for the induction of specific locus mutations was estimated to be about 23. A similar result was obtained with dominant visible mutations. Fast neutrons at high intensity (188 rads) gave a specific locus mutation frequency which was only one-eighth that from 214 rads at low intensity. Yields of other types of mutation were also very low after the high acute neutron dose. These results, when combined with those of W. L. Russell and associates using the same specific locus technique, suggest that there is at most only a slight dose-rate effect with fast enutrons except at high doses, when there is a very marked falloff in yield from acute exposures, leading to a reversed dose-rate effect. At lower doses, fast neutrons seem to be five to six times as effective as acute X-irradiation for the induction of specific locus mutations in mouse spermatogonia.

A68-80165
RADIOLOGICAL PROPERTIES OF BEAMS OF HIGH-ENERGY PROTONS.
Börje Larsson (Uppsala U., Gustaf Werner Inst., Sweden).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 304–311. 19 refs.
Contracts AF 61(052)-183 and AF 61(052)-740; Knut and Alice Wallenberg Found. Swed. Cancer Soc. and Swed. Med. Res. Council supported research.

A review of experimental data shows that protons in the energy interval from 20 MeV. and up to a few hundred MeV. of energy have about the same quantitative and qualitative effects on tissues as other sparsely ionizing radiation, except for a narrow zone in the final part of their range in which there is a marked increase in relative biological effectiveness. The further evaluation of the effects of high-energy protons on man should benefit by the increasing medical use of such radiation.

A68-80166
ACUTE EFFECTS OF HIGH-ENERGY PROTONS AND ALPHA PARTICLES IN MICE.
J. K. Ashikawa (Calif. U., School of Med., Los Angeles and Loma Linda U., School of Med., Los Angeles County Gen. Hosp., Depts. of Radiol.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 312–324. 19 refs.
NASA, AEC, and Calif. U. Supported research.

Fractionated doses of 730-Mev. protons and 910-MeV. α particles were used to determine the change in radiosensitivity of normal mouse intestine. A total dose of 940 rads was given to the whole body in a single acute dose or in two equal fractions. In both proton- and α-particle-irradiated animals, relative to the single-dose groups, a five- to sixfold decrease in gut death was noted when the two doses were separated by three hr. When the doses were separated by increasing intervals of time, two radiosensitive periods were observed. These agree well with the findings previously reported with X-rays. Dose fractionation apparently

does not affect hematopoietic tissues in the same way as gut tissues, since marrow death was not altered at these dose levels. The relative effectiveness of 730-MeV. protons, degraded to 200 MeV. with copper or carbon absorbers, is not significantly different from the undegraded beam. The RBE for LD_{50} at six days was 0.98, and 0.79 at 30 days for carbon; for copper the six-day relative biological effectiveness (RBE) value was 0.95 and 0.75 at 30 days. The corresponding RBE values of the undegraded beam were 0.96 and 0.75. The biological effect of secondary particles in the degraded beams was negligible in mice. The relative effectiveness of high-energy protons and α particles for induction of dominant lethals by spermatogonial irradiation was determined. Based on the rates of abnormal embryos to total implantations the RBE of 730-MeV. protons and 910-MeV. α particles, relative to 250-kVp. X-rays, appeared to be about unity.

A68-80167
PROTON-IRRADIATION EFFECTS IN PRIMATES.
Robert Zellmer, James Culver, and John E. Pickering (School of Aerospace Med., Brooks AFB, Tex.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965.)
Radiation Research, Suppl. 7, 1967, p. 325–329.

A series of experiments was reported in which determinations of the biological effects of protons on monkeys were made in order to provide the shield design engineers with data to enable them to design better protection with a minimum of weight penalty. The relative biological effectiveness of proton irradiation was determined. Clinical observations of irradiated animals were included.

A68-80168
ACUTE SOMATIC EFFECTS IN PRIMATES OF PROTONS TO 400 MEV.
I. R. Lindsay and G. V. Dalrymple (School of Aerospace Med., Aerospace Med. Div., Brooks AFB, Tex.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 330–335. 10 refs.
NASA supported research.

The biological effects in the monkey, *Macaca mulatta,* irradiated with protons of discrete energies selected to represent significant portions of the space proton spectrum were studied. Protons that penetrate only the superficial tissues and those that have sufficient range to penetrate the entire body thickness were included. In general, the highly penetrating protons produce no really new or unusual findings. The only significant clinical departure from the experience with 2-MeV. x-rays is increased severity of gastrointestinal and hemorrhagic signs. Relative biological effectivenesses based on 30-day mortality are approximately 1. The etiology of deaths occurring after 32-MeV. proton irradiation is also understandable. If sufficient energy is delivered into the skin, subcutaneous tissue, and underlying muscle, necrosis is produced. Once the necrosis occurs, infection sets in, and the progression of the clinical picture is similar to that produced by thermal burns.

A68-80169
EFFECTS OF ACUTE EXPOSURE TO HIGH-ENERGY PROTONS ON PRIMATES.
S. Tom Taketa, Bruce L. Castle, Wayne H. Howard, Charles C. Conley, and Webb Haymaker (NASA, Ames Res. Center, Moffett Field, Calif.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 336–359. 41 refs.

The biological effectiveness of high-energy graphite-attenuated protons was compared with that of ^{60}Co γ radiation in monkeys given 4 π whole-body irradiation. The end points were mortality, clinical observations, necropsy, and microscopic findings, and changes in body weight and peripheral blood erythrocytes and leukocyte counts. Data based on midpoint air dose, midpoint tissue dose, and average body dose were used for the evaluation. Protons appeared to be as effective or slightly more effective than γ rays when the comparisons were based improperly on midpoint air dose, but less effective when based properly on absorbed tissue dose. The general appearance, symptoms of radiation syndrome, and pathological changes were essentially similar in the two irradiated groups. Silver impregnation of the brains of 15 of the animals revealed glial activation in most of the animals. This was considered a radiation effect.

A68-80170
ELECTRICAL REACTION OF RESPIRATORY MUSCLES IN RESPONSE TO VARIOUS REGIMENS OF THE APPARATUS ARTIFICIAL RESPIRATION [ELEKTRICHESKIE REAKTSII DYKHATEL'NYKH MYSHTS NA RAZLICHNYE REZHIMY APPARATNOGO ISKUSSTVENNOGO DYKHANIIA].
V. P. Doroshchuk (UkrSSR, Acad. of Sci., A. A. Bogomol'ta, Inst. of Physiol., Kiev).
Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia, vol. 11, Jul.–Aug. 1967, p. 48–53. 10 refs. In Russian.

As revealed in experiments on cats and puppies, electrical reactions of the respiratory muscles to artificial respiration depended on the pressure regimen, used during the phase of inspiration and the phase of expiration, and were of the character of Gering–Breyer reflexes. In artificial respiration under positive pressure there was a depression of the electrical activity of the inspiratory muscles and a stimulation (up to the appearance of continuous pulsation) of the electrical activity of the expiratory muscles. In artificial respiration with the prevalance of a negative pressure phase electrical activity of the expiratory muscles was depressed and that of the inspiratory ones was stimulated. These represented reactions of the reflex respiratory muscle resistance, directed against the action of the given artificial respiration regimen. In deep anesthesia electrical reactions of the respiratory muscles are depressed in response to any regimen.

A68-80171
OXYGEN, ASCORBIC ACID, AND THE LUNG.
D. R. Shanklin, J. J. Cunningham, C. Sotelo-Avila, and F. Crussi (Fla. U., Coll. of Med., Dept. of Pathol., Gainesville).
Archives of Pathology, vol. 84, Nov. 1967, p. 451–459. 31 refs.
John A. Hartford Found. supported research.

Gross injury to the guinea pig lung by oxygen ("hepatization") is not dependent on any given level of ascorbic acid (TAA). Depletion prior to oxygen challenge results in a change in the TAA of hepatized lung that can be accounted for by simple dilution from the influx of blood and edematous fluid containing little ascorbic acid. Oxygen challenge short of hepatization results in a level of pulmonary TAA compatible with that induced by scorbutic diet alone over the same time course. Similar declines in adrenal ascorbic acid were found. Animals with clear lungs after oxygen showed adrenal TAA values compatible with ordinary depletion over similar time intervals. Animals with hepatized lungs showed a further decline in adrenal TAA similar to that of hepatized lung but which could not be accounted for locally by influx of blood or fluid.

A68-80172
THE DIFFUSION OF OXYGEN, CARBON DIOXIDE, AND INERT GAS IN FLOWING BLOOD.
E. E. Spaeth and S. K. Friedlander (Calif. Inst. of Technol., W. M. Keck Eng. Labs., Pasadena).
Biophysical Journal, vol. 7, Nov. 1967, p. 827–851. 29 refs.
Grants NSF GP 2674 and PHS 2 T0 A ES0004-06.

Measurements were made of exchange rates of oxygen, carbon dioxide and krypton-85 with blood at 37.5 C. Gas transfer took place across a 1 mil. silicone rubber membrane. The blood was in a rotating disk boundary layer flow, and the controlling resistance to transfer was the concentration boundary layer. Measured rates were compared with rates predicted from the equation of convective diffusion using velocities derived from the Navier–Stokes equations and diffusivities calculated from the theory for conduction in a heterogeneous medium. The measured absorption rate of krypton-85 was closely predicted by this model. Significant deposition of material onto the membrane surface, resulting in an increased transfer resistance, occurred on one experiment with blood previously used in a nonmembrane type artificial lung. The desorption rate of oxygen from blood at low oxygen tension was up to four times the corresponding transfer rate of inert gas. This effect is described somewhat conservatively by a local equilibrium form of the convective diffusion equation. The carbon dioxide transfer rate in blood near venous conditions was about twice that of inert gas, a rate significantly greater than predicted by the local equilibrium theory. It should be possible to apply these theoretical methods to predict exchange rates with blood flowing in systems of other geometries.

A68-80173
EARS: ANATOMY HAZARDS MONITORING PROTECTION.
Charles W. Reed, Herbert Jones, and Robert B. Maas.
National Safety News, vol. 95, May 1967, p. 42–50.

This article deals with a review of the physiology of hearing and hearing loss in relation to noise hazards in industry. Methods of evaluating noise damaging to hearing are discussed. These include use of exposure meters and audiometry. The utilization of protective devices such as ear plugs and muffs is urged. A list of various noise producing operations and their sound pressure levels is given. The problem of making personnel wear protective devices is discussed, and techniques for overcoming complaints are given.

A68-80174
THE SPACECRAFT COMPUTER MANAGED LABORATORY—A CONCEPT FOR THE 70'S.
D. G. Bourke, L. Nalaboff, and P. R. Tobias (Intern. Business Machines Corp., Federal Systems Div., Los Angeles, Calif.)
Yale Scientific Magazine, vol. 42, Oct. 1967, p. 6–8, 10, 12, 28.

The spacecraft, computer managed laboratory (CML), is certainly not the least ambitious of concepts to be advanced for missions of the 70's. It basically proposes to bring the scientific and engineering emphasis of future missions into greater balance. It offers high rewards, while carrying with it an increased burden on both parties. One of the most outstanding characteristics of this concept though, is that the burden is more uniformly a scientific one to the scientists and an engineering one to the engineers. It is the authors opinion that the most outstanding characteristic of the spacecraft CML, is that the concept can produce a substantial technological spin-off to terrestrial application areas during its developmental period regardless of whether it is ever realized in space. Indeed, one of the technological growth areas necessary for the development of the space-borne CML is the terrestrial CML, having potential applications to the FDA drug testing center, health screening programs of HEW, pharmaceutical research, and clinical laboratories. In keeping with the spirit of partnerships between government and industry to solve major national problems, it would seem highly desirable to plan the CML technology spin-off toward health and other pressing civil problem areas.

A68-80175
HEAT REACTIONS OF BUSHMEN.
C. H. Wyndham, N. B. Strydom, and C. H. van Graan (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab., Johannesburg, South Africa).
Internationale Zeitschrift für angewandte Physiologie, vol. 24, Sep. 18, 1967, p. 208–221. 12 refs.

When Bantu males are exposed to ambient air temperatures of 78, 82, 86 and 90°F. effective temperature (E.T.), it is possible to distinguish clearly between unacclimatized, partially acclimatized and highly acclimatized states. A sample of Bushmen was exposed to this range of E.T.'s in a portable climatic chamber. Their rectal temperatures at the end of the third hour of exposure reached 101°F. at 78° and 82°F. E.T., 102.2°F. at 86°F. E.T. and 102.5°F. at 90°F. E.T. Sweat rates were highest in the first hour of exposure in all four heat stress conditions. Sweat rates decreased generally throughout the three-hour period, but the rank order of sweat rates was maintained. Sweat rates were plotted against rectal temperatures for each hour and also for the average values of the three hours of exposure. Curves fitted to the Bushmen data lie between the curves fitted to the data of unacclimatized and acclimatized Bantu for each of the three hours. When curves relating the mean sweat rates for the three hours of exposure at each of the E.T. conditions are compared with those for unacclimatized and acclimatized Bantu, it is found that the curve drawn on the Bushmen data again occupy a position midway between the other two curves. These three groups and a group of U.S. students are also compared in this paper in terms of physiological limits based on a steady level of rectal temperature, and based on the percentages of the samples exceeding a rectal temperature of 101°F. and 102.5°F. The limiting E.T.'s for the Bushmen were found to be similar to those of unacclimatized Bantu and, generally, higher than for the U.S. students.

A68-80176
PULMONARY MECHANICS IN YOUNG HEALTHY MEN NORMAL VALUES FOR SOME LESS FREQUENTLY USED PARAMETERS.
N. Gavrilescu, D. Teculescu, D. Stanescu, and I. Constantin (Inst. of Hyg., Dept. of Occupational Diseases, Cardiopulmonary Lab., Bucharest, Rumania).
Internationale Zeitschrift für angewandte Physiologie, vol. 24, Sep. 18, 1967, p. 194–207. 64 refs.

Pulmonary mechanics (including over-all and specific compliance, static expiratory compliance, coefficient of retraction, maximum inspiratory pressure) were investigated in a group of 44 healthy males, homogenous in regard to age and height. Results are compared to previous studies. A normal distribution was found for functional compliance, whereas that of static compliance was skew. Coefficient of variation was lower than those reported previously (between 21% for functional compliance and 27% for static expiratory compliance). The limits in interpreting the results imposed by the high dispersal are stressed.

A68-80177
ANALYSIS OF RESPIRATORY GASES IN BLOOD.
James M. Hofford (Wilmington Med. Center, Pulmonary Function Lab., Del.)
Delaware Medical Journal, vol. 39, Oct. 1967, p. 276–278. 7 refs.
Del. Tuberc. and Health Soc. supported research.

Multiple samples of gases extracted from one ml. of blood can be analyzed combining the use of a gas-tight syringe, a VanSlyke volumetric apparatus, and the gas chromatograph. The chromatographic analysis of blood has several advantages. The technique can be carried out with a much less experienced technician than is required for the best manometric VanSlyke analyses.

Additional gases such as nitrogen can be simultaneously determined. There is little instrument maintenance and results are obtained quickly. After the gas has been extracted from blood, it requires only 1 min. 20 sec. for an oxygen analysis, 2 min. 20 sec. for nitrogen, and 1 min. for carbon dioxide. Time can also be saved with this method since 3 or 4 samples can be obtained for analysis from a 1 ml. sample of blood.

A68-80178
THE APPLICATION OF GAS CHROMATOGRAPHY TO PULMONARY FUNCTION TESTING.
James M. Hofford (Wilmington Med. Center, Pulmonary Function Lab., Del.) and Howard P. Angstadt (Sun Oil Co., Res. and Develop. Div., Marcus Hook, Pa.)
Delaware Medical Journal, vol. 39, Oct. 1967, p. 272–276. 7 refs. Del. Tuberc. and Health Soc. supported research.

The usefulness of the gas chromatograph in biomedical and especially cardiopulmonary laboratories for simplified analyses of respiratory gases is stressed. Practical points relative to the simplified operation of a gas chromatograph for oxygen, carbon dioxide and nitrogen analyses are presented. Some of the accessory instrumentation previously thought to be necessary can be eliminated by following these principles. The first point stresses the importance of carefully determining the sample volume that allows a linear response. The volumes are much smaller than previous reports would suggest. The second deals with the use of the gas tight syringe as the best method of sample introduction. The analytical results obtained with the gas chromatograph approach those obtained with the Scholander and VanSlyke instruments used as standards of reference.

A68-80179
ON THE RADIOPROTECTIVE EFFECT OF SOME CHLOLINOMIMETICS [ZUR STRAHLENSCHUTZWIRKUNG EINIGER CHOLINOMIMETIKA].
K. Effler and A. H. Staib.
Radiobiologia Radiotherapia, vol. 8, no. 4, 1967, p. 479–483. 15 refs. In German.

Cholinomimetics arekoline, tremorine and oxotremorine showed a significant radioprotective effect to lethal and sublethal doses, as well as the well-known hypothermic effect, depending on dose and environmental temperature in the mouse. While in the pharmacological suppression of hypothermia by cholinolytics the radioprotective effect also disappears, it is maintained during the physical elimination of the decrease in body temperature. Hypothermia was not the decisive factor for the radioprotective effect of the investigated substances. The role of hypoxia in the radioprotective mechanism was discussed.

A68-80180
SOME EXPERIMENTS ON A DELAY LINE SIMULATING THE HUMAN SYSTEMIC ARTERIAL TREE, WITH SPECIAL EMPHASIS ON THE BALLISTOCARDIOGRAM.
N. Westerhof, A. Noodergraaf (Pa. U., Moore School of Elec. Eng., Dept. of Biomed, Eng., Philadelphia), and W. R. Scarborough (FAA, Office of Aviation Med., Georgetown Clin. Res. Inst., Washington, D. C.)
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 141–150. 15 refs.
Grant PHS HE 10330-01 and Washington Heart Assn. supported research.

Experiments on aortic valvular insufficiency and aortic valvular stenosis are carried out using an electrical model of the human circulatory system. Different ejection flow patterns are simulated and the resulting ballistocardiographs (BCG's) are recorded. Results from the model concerning the Ultra low frequency ballistocardiograph (ULF-BCG) compare favorably with clinical findings. It is found that the acceleration BCG is strongly dependent on acceleration of blood through the aortic valves.

A68-80181
SIGNIFICANCE OF TONE-PITCH DURATION THRESHOLD FOR INFORMATION TRANSFER BY SHORT TONAL SIGNALS.
V. Majerník (Slovak Acad. of Sci., Inst. of Phys., Bratislava, Czechoslovakia).
Acustica, vol. 19, no. 1, 1967/68, p. 33–37. 9 refs.

The information content, transferred in a unit of time by tone signals the duration of which equals to their tone-pitch duration threshold (tonic signals), is given by means of an empirical relation between the tone-pitch duration threshold and the standard deviation of the pitch of tone signals estimated by matching. A possible measure for a kind of hearing defect is proposed. There has been found such a probability distribution of tonic signals, that its specific information content for a given mean duration becomes a maximum.

A68-80182
A MATHEMATICAL MODEL OF THE BALLISTOCARDIOGRAM.
Robert L. Morse (U.S. Naval Aerospace Med. Inst., Pensacola, Fla.)
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 136–140.

Modification of NOORDERGRAAF'S theory of the ballistocardiogram(BCG) provides a mathematical model which may be used for theoretical and clinical study of the BCG. In the theoretical part of this study of the BCG, the contribution of the pulse wave contour and arterial elasticity to the BCG signal is emphasized. In the clinical part a difference between younger and older normal subjects is demonstrated which may be due to a difference in arterial elasticity. Two general applications of the model have been demonstrated, but other expanded versions are clearly feasible. The availability of intrarterial blood pressure measurement and of multidimensional BCG recording could proportionately expand the accuracy and usefulness of the model.

A68-80183
TWO NEW FORMS OF ULTRA-LOW FREQUENCY BALLISTOCARDIOGRAPH.
W. K. Harrison and S. A. Talbot (Johns Hopkins Med. School, Dept. of Biomed. Eng., Baltimore, Md.)
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 13–18.
Grant PHS GM 10895-03.

A chair-type apparatus for recording vertical ballistocardiograms, and an air-supported bed, both ultra-low frequency type, are described. Novel design features of the chair are a torsion-bar toggle mechanism and rugged but compliant flexure pivots to support the patient vertically on a seven pound structure. The bed configuration, with a platform weight of about ten pounds, resembles a large air bearing in principle. Compressed air for its operation comes from a silenced industrial vacuum cleaner, and the small thickness of the apparatus makes possible its use on a fluoroscopy table. Comparison of recordings from normal patients taken on each instrument show that the ballistocardiographic IJ waves in the supine position are generally larger than those obtained in the sitting position. Possible reasons for this observation and other record differences are briefly discussed.

A68-80184
DESIGN OF A THREE-DIMENSIONAL HIGH FREQUENCY BALLISTOCARDIOGRAPH.
Ernst K. Franke and John R. Braunstein (Cincinnati U., Biophys. and Cardiac Labs., Ohio).
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 7–12. 8 refs.

The design of a three dimensional high frequency ballistocardiograph is described. The machine records only translational accelerations in the x, y and z axes with a minimum of body roll. Strain gauges are arranged to sense displacement of the patient in the three principal axes and a sturdy support system is utilized. Although a heavy chair is used the frequency response is good being 13.5 and 16.5 Hz. in two horizontal directions with a 70 kg. load. It is hoped that the chair will soon be converted to a bed.

A68-80185
THE COMPLETELY ISOLATED AIR BALLISTOCARDIOGRAPH.
D. M. Cunningham (Calif. U., Dept. of Mech. Design, Berkeley) and K. V. Saunders (Wash. U., Seattle).
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 1–6.

The design is given for a ballistocardiograph in which complete isolation of vertical vibration is attempted. The bed would have six degrees of freedom and allow for instant determination of cardiovascular force in size, sense and direction. The machine as designed has a bed-support system of gas bearings and air springs. A prototype unit has been operated in stable equilibrium at vertical and horizontal natural frequencies of 0.2 c.p.s. at subject-loads of 60–180 lbs. Vertical motion is damped.

A68-80186
BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE.
Edited by Abraham Noordergraaf and Gerald H. Pollack (Pa. U., Moore School of Elec. Eng., Dept. of Biomed. Eng., Philadelphia). *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, 150 p. Many refs.

This book is a collection of 19 papers presented at the Proceedings of the 11th Annual Meeting of the Ballistocardiograph Research Society held at Atlantic City, N. J. on April 30, 1966. Articles cover diverse aspects of ballistocardiography. These include designs of ballistocardiographs, physiological measurements of the cardiovascular system, and technical and operating problems with the ballistocardiographs.

A68-80187
CIRCADIAN RHYTHM IN SERUM 5-HYDROXYTRYPTAMINE OF HEALTHY MEN AND MALE PATIENTS WITH MENTAL RETARDATION.
Franz Halberg, John A. Anderson (Minn. U., Med. School, Minneapolis), Robert Ertel (NIH, Lab. of Clin. Biochem., Bethesda, Md.), and Heinz Berendes (Natl. Inst. of Neurol. Diseases and Blindness, Perinatal Res. Branch, Bethesda, Md.)
International Journal of Neuropsychiatry, vol. 3, Jul.–Aug. 1967, p. 379–386. 23 refs.
NASA Grant NsG-517, Grants PHS 4KO6-GM-13981-06, PHS NB-04531-02, PHS NB-00238-C3; Minn. Assn. for Retarded Children supported research.

Around an overall average of about 20 μg.%, 5-hydroxytryptamine (5-HT) in serum from (1) five healthy mature men and (2) eleven male patients with mental retardation, including patients with Down's disease, undergoes cirdadian rhythmic changes. The quantification of this 5-HT rhythm by the cosinor technique, applied by electronic computer, indicates average circadian amplitudes of 1.7 and 2.2 μg./100 ml. in groups (1) and (2), respectively. Expressed as percent of the overall sample mean computed irrespective of sampling time, the double amplitude of the circadian rhythm is on the average about 18%. The crest of this circadian rhythm, the acrophase, in subjects living on a routine of diurnal activity (and light) and nocturnal (21^{00} to 07^{00}) rest (and darkness) occurs between 04^{48} and 14^{44}. More generally, the acrophase may be given as a delay from the midpoint of the daily span of rest and/or sleep (and darkness in the subject's personal environment). Expressed in this fashion, the 95% confidence interval of the circadian acrophase in blood serum 5-HT extends from -50° to -199° ($15^{\circ}=1$ hr. since $360^{\circ}=24$ hr.). Such objective numerical measures of the amplitude and phase of circadian rhythmic variables represent dynamic endpoints for evaluating the periodicity encountered in various constituents of human blood; the amplitudes as well as the phases of some such rhythms are here presented in tabular form.

A68-80188
BLOOD ALCOHOL AND FLYING INABILITY. AN ATTEMPT TO ESTABLISH STANDARDS FOR GENERAL AERONAUTICS [BLUTALKOHOL UND FLUGUNTUCHTIG KEIT VERSUCH EINER ERARBEITUNG VON RICHTWERTEN FUR DIE ALLGEMEINE LUFTFAHRT].
K. E. Klein, K. Breuker, H. Brüner, and H. M. Wegmann (Deut. Versuchsanstalt für Luft- und Ramfahrt e.V., Inst. für Flugmed., Bad Godesberg, West Germany).
Internationale Zeitschrift für angewandte Physiologie, vol. 24, Sep. 18, 1967, p. 254–267. 33 refs. In German.

Alcohol was ingested in three different doses (0.28, 0.56, 0.84 g./kg. body weight within 10 to 15 min.) by young healthy males, and the blood alcohol concentration (BAK) and the psychomotor performance were measured in regular intervals of 20 to 60 min. for more than five hr. The ability to perform a complex psychomotor performance test as quickly and as accurately as possible was significantly reduced in the group (and in each individual), if the BAK had reached 0.015% (−0.025%) in the phase of the alcohol resorption, if the BAK was 0.035% (−0.045%) in the plateau, or if it was as high as 0.045% (−0.050%) in the phase of the alcohol elimination. The reduction in performance at a BAK plateau of about 0.09% corresponded well to the reduction caused in the same group by 0.5 g. Hexobarbital (Evipan) orally taken. The results emphasize the necessity of a regulation related to drinking, which, as in airline and military crews usually prohibits a person from acting as a crewmember in general aviation for a given time after the termination of the consumption of alcoholic beverages.

A68-80189
EFFECT OF PHYSICAL TRAINING ON SINGLE BREATH DIFFUSING CAPACITY MEASURED AT REST.
Edith Rosenberg (McGill U., Dept. of Exptl. Surg., and Roy. Victoria Hosp., Montreal, Canada).
Internationale Zeitschrift für angewandte Physiologie, vol. 24, Sep. 18, 1967, p. 246–253. 11 refs.

Single breath diffusing capacity for CO, D_L, was measured at rest repeatedly in ten University athletes at the beginning of the season and again after the last game. Heart rate during the performance of a standard step test was measured both at the beginning of the season and after the last game. All three of the athletes who played water polo for three mo. showed a significant increase in resting D_L due to an increase in KROUGH's K at the

end of the season and decrease in heart rate during the standard exercise. Of the other seven subjects four played soccer for only six wk. and three played rugger for eight wk. In six of these subjects K and D_L did not change. In the seventh in whom K and D_L were significantly increased, the heart rate during the standard exercise was also increased. It was concluded from these data that rigorous physical training over a three mo. period increases KROUGH's K and D_L measured at rest in healthy young men.

A68-80190

INFLUENCE OF MODERATE WORK DONE IN HIGH ALTITUDE SIMULATION CHAMBER, ON HEART FREQUENCY AND ARTERIAL PRESSURE [L'INFLUENCE D'UN EFFORT MODERE EFFECTUE EN ALTITUDE MOYENNE SIMULEE EN CAISSON, SUR LA FREQUENCE CARDIAQUE ET SUR LA TENSION ARTERIELLE].

J. J. S'Jongers, M. Hebbelinck, E. Robaye, J. Bande, and M. Segers (Brussels, Free U. Work Lab., Belgium).

Internationale Zeitschrift für angewandte Physiologie, vol. 24, Sep. 18, 1967, p. 222–230. 15 refs. In French.

A study was carried out on 18 men, 17–22 yr. of age. They were subjected to a simulated altitude of 2,450 m. during which time they performed work of 100 watts for six min. Heart rate increased and systolic pressure was depressed. Diastolic pressure was scarcely affected. Heart rate also remained high during recovery period. On the other hand the systolic and diastolic pressures were more depressed at altitude after effort than at sea level.

A68-80191

FURTHER EXPERIENCE WITH SIMULTANEOUS RECORDS OF ULF FORCE AND CAROTID PULSE DERIVATIVE.

Issac Starr (Pa. U., Dept. of Therap. Res., Philadelphia).

IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*

St. Louis, Warren H. Green, Inc., 1967, p. 99–102.

Grant NHI, HE-00625-16.

A discussion is presented of the similarities of carotid pulse derivative and the ballistocardiograph. The absence of the I wave in the presence of a sharp initial deflection of the pulse derivative is explained in terms of peripheral resistance. Other similarities are analyzed. The record of a patient with atrial fibrillation is reproduced.

A68-80192

MAGNETIC TAPE RECORDING OF BALLISTOCARDIOGRAMS AND OTHER PHYSIOLOGIC VARIABLES FROM SUBJECTS WITH AND WITHOUT CARDIOVASCULAR "DISEASE".

William R. Scarborough (NIH, Div. of Res. Grants, Bethesda, Md.), Edward Podolak (FAA, Office of Aviation Med., Georgetown Clin. Res. Inst., Washington, D. C.), and M. B. Whitlock (Georgetown U., School of Med., Dept. of Med., Washington, D. C.)

IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*

St. Louis, Warren H. Green, Inc., 1967, p. 72–98. 7 refs.

Methods for the recording on magnetic tape of ballistocardiograms and a variety of other types of physiological variables have been described. Some of the kinds of data being acquired on tape from an aging population group was illustrated with strip-chart records reproduced from selected portions of the original tapes in a few individual cases. The nature and significance of the findings in these individuals were described. The advantages and disadvantages of magnetic tape recording and of conventional recording techniques were compared and briefly discussed.

A68-80193

A BALLISTIC METHOD TO DETERMINE THE FRACTION OF THE TIDAL VOLUME CONTRIBUTED BY THE DIAPHRAGM.

W. T. Josenhans (Dalhousie U., Dept. of Physiol., Halifax, Canada).

IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*

St. Louis, Warren H. Green, Inc., 1967, p. 68–71.

Muscular Dystrophy Assn., Canada supported research.

A method is described for determining the diaphragmatic contribution to the tidal volume. A Stead–Wells respirometer is used in conjunction with a ballistograph, and the respiratory tracing is recorded by means of a displacement transducer. In an actual experiment the contribution of the diaphragm to the tidal volume is 458 ml. or 65.4%. Other problems of using a trolley system in the technique with the respirometer are discussed.

A68-80194

THE CARDIOVASCULAR THORACIC AIR PLETHYSMOGRAM.

P. D. Verdouw, N. Westerhof, and A. Noordergraaf (Pa. U., Moore School of Elec. Eng., Dept. of Biomed. Eng., Philadelphia).

IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*

St. Louis, Warren H. Green, Inc., 1967, p. 63–67. 8 refs.

Grant PHS HE 10330-01.

The expected air displacement through the open glottis during suspended respiration is calculated and compared with experimental results obtained by others. The prediction of this thoracic air plethysmogram is based on the instantaneous difference between flow into and out of the thoracic cavity under simplified conditions. The results indicate that the described quantitative approach provides a first order interpretation of the observed air flow through the glottis.

A68-80195

BREATH HOLDING EFFECTS ON ULF DISPLACEMENT BALLISTOCARDIOGRAPHY.

William T. Josenhans (Dalhousie U., Dept. of Physiol. and Biophys., Halifax, Canada).

IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*

St. Louis, Warren H. Green, Inc., 1967, p. 49–62. 24 refs.

MRC, Canada supported research.

The aim of this paper is to investigate how the holding of the breath at various degrees of lung distention affects the ultra-low frequency-ballistocardiograph (ULF-BCG) and to compare open and closed glottis while holding the breath at a constant level of lung distention. With the airways closed the respiratory muscles relaxed, an increase in lung volume produced an increase in airway pressure. The amplitude of the ULF-BCG decreased when the intrapulmonary pressure rose. With the airways open, the amplitude of the ultra-low frequency (ULF) displacement ballistocardiogram and of the cardiogenic air pulse increased with lung distention. The ULF-BCG amplitude is more influenced by the airway pressure than it is by the lung volume per se. This leads to a net decrease in BCG amplitude with rising lung distention when the glottis is closed and the respiratory muscles are relaxed. ULF displacement BCG and cardiogenic air pulse are similar in contour. It is concluded that both ULF-BCG and cardiogenic air pulse are caused by beat-to-beat changes in intrathoracic blood volume. A new theory of the causation of the ULF displacement BCG based on a comparison of the contours of cardiogenic air pulse and ULF-BCG is presented in the Appendix.

A68-80196
BALLISTOCARDIOGRAPHIC WAVEFORM—SOME CONTRIBUTING FACTORS.
David H. Jackson, Albert Oberman, Robert E. Mitchell, and Ashton Graybiel (U.S. Naval Aviation Med. Center, U.S. Naval Aerospace Med. Inst., Pensacola, Fla.)
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 43–48. 16 refs.
NASA and PHS supported research.

Various historical and physical factors are correlated with ballistocardiograph (BCG) durations and amplitudes to determine how they may influence the BCG waveform. An attempt is made to explain the relationships in a physiological manner. The results of this study do not conflict with serial or qualitative utilization of the BCG in assessing cardiovascular status but emphasize the multiplicity of factors which affect the BCG form.

A68-80197
MONITORING OF HEMODYNAMIC PARAMETERS BY THE BCG IN CONSCIOUS MAN.
N. Ty Smith and Charles E. Whitcher (Stanford U., School of Med., Dept. of Anesthesia, Palo Alto, Calif.)
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 36–42.
Contract DA-49-193-MD-2135, Grants PHS GM 12527 and PHS HE 07812.

The analog computer solution of the Starr ballistic stroke volume formula was applied in the study of hemodynamic parameters in conscious volunteers. An additional program for computation of cardiac output, total peripheral resistance, and left ventricular minute work from stroke volume, heart rate, and mean arterial pressure was presented. Stroke volumes determined by dye-dilution correlated well with those obtained from the Starr formula, both before and after administration of methoxamine, mephentermine, or atropine.

A68-80198
THE BALLISTOCARDIOGRAM AND LEFT VENTRICULAR EJECTION IN THE DOG.
P. J. Winter, D. C. Deuchar, A. Guz (Guy's Hosp., Cardiac Dept., London, Great Britain), and M. I. M. Noble (Fulham Hosp., Charing Cross Hosp. Med. School, London, Great Britain).
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 33–35
Grant NIH HE 06851-04 and Boehringer Ingelheim, Ltd. supported research.

The relationship between myocardial contractility as measured by acceleration of blood into the aorta, and the amplitude of the early systolic waves of the force ballistocardiograph was studied in dogs. Myocardial contraction was increased with drugs or inhibited by coronary artery occlusion. During careful analysis of the records which avoided the disturbances of arrhythmia or respiration a clear relationship between the amplitude and contraction was seen. These findings should encourage workers to apply the ballistocardiogram in assessing myocardial contractility in man.

A68-80199
A SERVO COUNTERFORCE BALLISTOCARDIOGRAPH. AN APERIODIC AIR-BEARING SYSTEM.
J. Nyboer (Wayne State U., School of Med., Rehabil. Inst. and Dept. of Physiol. and Pharmacol., Detroit, Mich.), K. A. Reid (U.S. Rubber Co., Detroit, Mich.), and W. Gessert (Eastern Mich. State U., Dept. of Phys., Ypsilanti).
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 26–32. 6 refs.
Mich. Heart Assn. and Rehabil. Inst. supported research.

A new method of recording force ballistics of respiration and circulatory pulses is demonstrated. It eliminates accessory damping and has an intrinsically flat frequency response of 0 to 16 c.p.s. The method is based on the principle that a counterforce applied to the platform to hold it at a zero reference position will be equal and opposite to the force applied to the platform by the subject.

A68-80200
A QUANTITATIVE BALLISTOCARDIOGRAPH.
Z. Trefny and J. Wagner (Charles U., Fac. of Phys. Educ. and Sport, Prague, Czechoslovakia).
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 19–25.

A ballistocardiographic method is presented which is based on the interaction between two systems, the body and the ballistocardiograph. This quantitative method enables one to measure the absolute value of force acting on the ballistocardiograph. The authors' new portable ballistocardiograph, used for this purpose has the total mass of 7.2 kg. (the frame construction with accessories, 5.4 kg., and the moving part, 1.8 kg), natural frequency 12,000 c.p.s. without patient and 1,000 c.p.s. when loaded by a person with a mass of 100 kg. The properties of the apparatus enable the authors to collect a considerable number of quantitative ballistocardiograms, registered in healthy persons as well as in patients suffering from cardiovascular disease. The apparatus is not sensitive to the vibrations of the floor, so that it can be used anywhere without any protection against usual vibrations. The calibrated ballistocardiograms are being collected for the analysis of cardiovascular functions.

A68-80201
COMPUTER SEARCH FOR BALLISTOCARDIOGRAPHIC INDICES OF CARDIOVASCULAR DISEASE.
Walter E. Tolles (Cutler-Hammer, Inc., Airborne Instr. Lab., Long Island, N. Y.)
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 126–135. 8 refs

Earlier, the results were reported of a study to determine the value of using a general-purpose digital computer as an aid to the diagnosis of heart disease. The study was limited to one heart disease, left ventricular hypertrophy (LVH) of two etiologies—hypertension or aortic insufficiency. The dynamic measurements recorded on each subject were electrocardiograph (ECG), ballistocardiograph (BCG), arterial pulse, and phonocardiogram. The principal conclusions were: the computer could distinguish between the two causative factors with the ECG data alone, and the BCG was as effective as the ECG in pathological classification though these positive BCG results were not expected from the then current views in the literature.

A68-80202
OBSERVATIONS ON POSSIBLE ATRIAL CONTRIBUTION TO VENTRICULAR DYNAMICS AS RECORDED BY THE DIRECT BODY HIGH-FREQUENCY ("ACCELERATION") BCG.
Nahum J. Winer (Lenox Hill Hosp., Dept. of Med., New York, N. Y.)
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 116–125. 15 refs.
Dr. Simon Baruch Found. for Med. Res. supported research.

Physiologic evidence for atrial contribution to ventricular dynamics are more than suggestively mirrored in the ballistocardiogram. The forces of atrial contribution to ventricular volume as the dominantly determining factor in BCG ventricular dynamics seems apparent. The forces of contraction itself may play a role where atrial contraction follows that of the ventricle. These are manifest in a-v dissociation or premature nodal beat where the first is evident as P approaches QRS and, the second, as P is superimposed or is past QRS. The premature atrial beat bears an unduly dominant effect on the initial HI downstroke in the face of the deteriorated J of poor ventricular filling. Prolongation of P-Q causes deteriorated dissociation of this HI segment and, conversely, is improved with its shortening. Conversion from atrial fibrillation to normal sinus rhythm appears accompanied by increased amplitude and striking regularization of ventricular dynamics.

A68-80203
ISOLATED BALLISTOCARDIOGRAPHIC ABNORMALITY WITH INDUCED ANOXEMIA IN A PATIENT WITH RECENT MYOCARDIAL INFARCTION.
Raymond Penneys (Pa. U., Hosp., Vascular Sect., Philadelphia).
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 110–115.

An induced anoxemia test for coronary artery disease was done to elicit objective evidence of coronary artery disease on a patient who had suffered an acute myocardial infarction five wk. previous because his electrocardiograms, and other routine clinical tests, were normal. His anoxemia test was negative in that anginal symptoms or specific changes in the electrocardiogram were not produced. His ballistocardiogram, however, became markedly abnormal. This ballistocardiographic response on low oxygen gives additional support for its acceptance as a valid criterion for the diagnosis of coronary artery disease.

A68-80204
THE SECOND DERIVATIVE OF THE CAROTID PULSE AS AN AID IN HIGH-FREQUENCY ("ACCELERATION") DIRECT BODY BCG SEGMENT NOTATION.
Nahum J. Winer (Lenox Hill Hosp., Dept. of Med., New York, N. Y.)
IN: BALLISTOCARDIOGRAPHY AND CARDIAC PERFORMANCE. *(Ballistocardiograph Res. Soc., Proc. of 11th Ann. Meeting, Atlantic City, N. J., Apr. 30, 1966).*
St. Louis, Warren H. Green, Inc., 1967, p. 103–109.
Dr. Simon Baruch Found. for Med. Res. supported research.

Without sharply correlative landmarks throughout all of systole, the errors in ballistocardiograph (BCG) segment notation—hence, in interpretation—may readily supervene; the second derivative of the conventional carotid pulse (CP^2) is submitted as such a sensitive correlative device. With it, the diminution in error in segment notation has been decisive; there are indications suggesting a need for reconsideration of what constitutes the "normal" BCG pattern.

A68-80205
SMALL-STEP AND LARGE-STEP COLOR DIFFERENCES FOR MONOCHROMATIC STIMULI OF CONSTANT BRIGHTNESS.
David H. Krantz (Mich. U., Psychol. Dept., Ann Arbor).
Journal of the Optical Society of America, vol. 57, Nov. 1967, p. 1304–1316. 30 refs.
Grant NIH NB 04342; Sigma Xi-RESA supported research.

Five observers made color-difference judgments by the method of triads. A triad (S: A,B) consisted of a standard stimulus S and two comparison stimuli, A and B. The observer reported which color difference appeared smaller, that between A and S or that between B and S. Triads were composed of monochromatic stimuli, adjusted to constant brightness for each observer. They contained both small color differences and ones that are markedly supraliminal. For any triad (S: A,B) it was assumed that the choice probability is an index of the relative sizes of the subjective differences (A,S) and (B,S). Estimated choice probabilities were converted to estimated distance measures by means of a scaling model based on assumptions about the observers' judgmental task. The obtained distance estimates were compared with standard wavelength-discrimination data, with previous data on slightly supraliminal color differences, and with the large-difference predictions of the Hurvich–Jameson HBS color specification system. While the present data cannot be regarded as providing definitive color-difference measures (even for the limited range of conditions employed) they nevertheless contribute to the development of a metric space representation combining discriminability and supraliminal similarity.

A68-80206
INTRA-ABDOMINAL INJURIES CAUSED BY AUTOMOBILE SEAT BELTS.
John R. LeMire, Daniel E. Earley, and Chapin Hawley (Christ Hosp., Dept. of Radiol., Cincinnati, Ohio).
Journal of the American Medical Association, vol. 201, Sep. 4, 1967, p. 735–737. 12 refs.

Automobile safety belts rarely cause intra-abdominal injury, especially if properly worn. Only 23 cases have been previously reported in the literature. When such injury does occur, evidence of it may not be apparent when the patient is first seen. The physician must be alert to this possibility. Physical findings, blood studies, paracentesis, and diagnostic roentgenograms may lead to the diagnosis or indicate the necessity for an exploratory laparotomy. Use of the three-point belt (lap belt plus shoulder harness) was recommended.

A68-80207
PHYSICAN REPORTING OF AIRCRAFT PILOT IMPAIRMENTS.
Committee on Aerospace Medicine of the Council on Occupational Health.
Journal of the American Medical Association, vol. 201, Sep. 11, 1967, p. 871–872.

In a 1966 instance, 83 deaths resulted from the crash of an airplane piloted by a person who had been examined two mo. previously, and was granted a renewal of his certificate, in the absence of any knowledge or evidence of his impairment. The Civil Aeronautics Board (CAB) investigation of the crash revealed that the pilot was taking medication for both diabetes and cardiovascular disease at the time of the crash. Such an event dramatically emphasizes the ethical problems of any physician with a patient who possesses a Federal Aviation Administration (FAA) pilot certificate, whether he be an airlines pilot, a business pilot, or even an air traffic controller. The private physicians cannot be expected to know all the details of the disqualifying items in the medical

regulations and standards of the FAA. Nor can he easily justify under prevailing ethical principles the revelation of confidential medical information acquired in the physician–patient relationship. Yet he is faced with the possibility that failure to reveal such information may carry responsibility for a disaster involving the deaths of his patient and of many other innocent people. The Judicial Council of the American Medical Association has suggested an available procedure for solving many of these problems by an entirely ethical method. This would necessitate only that the FAA medical examination form for pilot certification be revised in a manner long demanded by most life insurance companies, as follows: the applicant should be required to name all physicians who have examined or treated him, and to sign a release authorizing such physicians to supply pertinent information from medical records to the Aviation Medical Examiner or FAA physician before certification or recertification of the pilot license. This would of itself protect the reporting physician provided with the release, and thus document the applicant's consent to such reporting. This would place the authorization for reporting squarely on the applicant, where it belongs.

A68-80208
HEAVY-PARTICLE STUDIES WITH SILICON DETECTORS.
Mudundi R. Raju (Calif. U., Lawrence Radiation Lab., Berkeley).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 43–52. 5 refs
NASA and AEC supported research.

Lithium-drifted silicon semiconductor detectors give very promising results in measuring energy loss and energy distribution of high-energy alpha particles and protons. Indeed, the agreement between the theoretical and experimental values of residual energy and energy loss is very good. The energy distribution at the Bragg peak positions of 910-MeV. alpha particle and 49-MeV. protons is measured in order to evaluate the dE/dx or LET_∞ distribution at the Bragg peak. From the data it appears that the modal energy of the heavy particles at the Bragg peak position is roughly 10% of the primary beam energy. The fact that the particles have relatively high energies at the Bragg peak position indicates that the dE/dx or LET_∞ there is not high. The rem dose at the downward slope of the Bragg peak, however, would be much higher than the rad dose, owing to the higher dE/dx or LET_∞ values there.

A68-80209
THE PHYSICAL CHARACTERISTICS OF SOLAR FLARES.
S. B. Curtis (Boeing Co., Seattle, Wash.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 38–42. 6 refs.

Several conclusions were drawn from considerations of the magnitude of radiation doses expected in space. First, the strong depth-dose dependence indicated by other researchers shows the dose deposited to the skin and organs near the surface of the body to be significantly greater than that deposited to the organs in the interior of the body. Second, the point doses and energy-loss (dE/dx) spectra show that, at least behind thin shielding, the highly ionizing contribution cannot be neglected. In this connection, if high dE/dx radiation damage to irreplaceable cells, such as neural or retinal cells, undergoes little or no repair, such damage will accumulate during a long mission. The hazard from malfunction of critical organs containing such cells may prove to be a very important consideration on extended space flight.

A68-80210
THERMAL SPIKE EFFECTS IN HEAVY-ION TRACKS.
Amos Norman (Calif. U., School of Med., Dept. of Radiol., Los Angeles).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967 p 33–37. 23 refs.

The material within heavy-ion tracks is raised to a high temperature with the following consequences: The rates of various physical and chemical processes are greatly increased, and the heated material expands explosively. This model can account for some observed linear energy transfer and temperature effects in radiation biology and radiation chemistry, and it accounts very well for radiation nucleation in liquids.

A68-80211
SECONDARY-ELECTRON DISTRIBUTION FOR HEAVY IONS.
Nobuo Oda and John T. Lyman (Calif. U., Lawrence Radiation Lab., Berkeley).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 20–32. 29 refs.
NASA and AEC supported research.

Two kinds of approaches to the δ-ray correction for heavy ions are discussed: space-averaged picture and extended-track picture. The fundamental quantity for the space-averaged picture is the differential flux (slowing-down spectrum), $\phi\delta(E)$, of δ rays. Experimental results are presented on the energy spectra and absolute yield values of the low-energy part of $\phi\delta(E)$. The most interesting results are as follows: (1) when the velocities of primary ions are the same, the yields for each kind of ion are proportional to dE/dx; and (2) when the velocities are different for each kind of ion, the specific yield for higher velocity is higher than that for lower velocity. The discussion of several related problems suggest the importance of studies on the behavior of energy spectra of the secondary-electron flux.

A68-80212
RADIOLOGICAL PHYSICS OF PIONS.
Johan Baaril (CERN, Geneva, Switzerland).
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10 1965).
Radiation Research, Suppl. 7, 1967, p. 10–19. 11 refs

A short review is given of the possible application and problems associated with negative pion beams for therapy, radiobiology, and dosimetry. Some experiments are described of the dose distribution in water irradiated with a 70-MeV. pion beam from the CERN 600-MeV. Synchro-Cyclotron. The results show that the maximum dose rate is measured at 14.8-cm. penetration depth with a 2.2 ratio between this and the entrance dose rate. Isodose distribution of this beam in water is also presented. The radiation quality (QF's) evaluated from measurements with a high-pressure tissue-equivalent ionization chamber show values from 2.7 to 3.4 in the peak and a value of 1 at the beam entrance. Calculated depth doses compared with the measurements seem to indicate that about 20 MeV. is locally deposited in water per interaction negative pion. Considering QF and buildup factors, particles per square centimeter per second for producing 1 mrem. per hr. are compared with 400-MeV. neutrons, 600-MeV. protons, and 70-MeV. pions.

A68-80213
INTERACTIONS ABOVE 10 GEV.
Frederick P. Cowan (Brookhaven Natl. Lab., Health Physics Div., Upton, N. Y.)
(Workshop Conf. on Space Radiation Biol., Proc., Calif. U., Berkeley, Sep. 7–10, 1965).
Radiation Research, Suppl. 7, 1967, p. 1–9. 14 refs.
AEC supported research.

Attempts are made to classify and describe the interactions occurring in the GeV. energy region with emphasis on energies greater than 10 GeV. From a dosimetric point of view, the situation is favorable, since no basically different processes are known or expected above 10 GeV. as compared with those in the 1- to 10-GeV. region. On the other hand, dosimetry in this region of ultrahigh energy is made difficult by the long mean free paths of the particles concerned and the complicated patterns of decay and production. Thus, the composition of radiation, the value of the absorbed dose, and the applicable relative biological effectiveness/radiation quality values are dependent not only on the nature of the primaries involved but also on the previously encountered material and geometric factors. Although difficult, these problems are being successfully attached from both the theoretical and experimental point of view.

A68-80214

EVALUATION OF QUANTITATIVE IMPEDANCE PLETHYSMOGRAPHY FOR CONTINUOUS BLOOD FLOW MEASUREMENT. II. IN VITRO MODEL EXPERIMENTS.

David G. Young, Jr., Robert H. Cox, Emergy K. Stoner, and William J. Erdman (Pa. U., Hosp., Dept. of Phys. Med. and Rehabil., Philadelphia).

American Journal of Physical Medicine, vol. 46, Oct. 1967, p. 1373–1383. 19 refs.

VRA and Maclellan-Sloan Res. supported research.

Simultaneous resistance and volume measurements were performed with an *in vitro* model utilizing an arterial segment and canine blood. The steady-state resistance changes were found to be linearly related to the lateral volume pulsations and the resistance changes measured during venous occlusion were linearly related to the volume flow rate. With the proper mathematical relations, resistance changes could be used to predict volume changes. The average resistance change over one pulse cycle was not found to be linearly related to the average volume flow rate.

A68-80215

SKIN SENSITIVITY TO ULTRAVIOLET IRRADIATION IN PERSONS WORKING IN THE OPEN AIR AND IN CLOSED PREMISES [CHUVSTVITEL'NOST' KOZHI K UL'TRAFIOLLETOVOMU OBLUCHENIIU U RABOTAIUSHCHIKH NA OTKRYTOI TERRITORII I V ZAKRYTYKH POMESHCHENIIAKH].

E. N. Nikolaeva (USSR, Acad. of Med. Sci., Inst. of Hyg., Labor, and Prof. Diseases, Moscow).

Gigiena i Sanitariia, no. 7, Jul. 1967, p. 27–31. 6 refs. In Russian.

The author determined the time necessary for the development of erythema as the result of doses of ultraviolet irradiation with a lamp placed at a distance of 0.5 m., in summer and in winter among persons (builders), working in the open air all year round, and among the workers of a mechanical work shop. The skin sensitivity to ultraviolet light was found to be higher (by 28.5% in summer and by 36.6% in winter) in persons working in closed premises than in the builders. The time of ultraviolet irradiation necessary for the development of erythema in 46% of mechanical shop workers amounted to one min.; the latter may point to ultraviolet light deficiency.

A68-80216

EFFECT OF LONG-TERM NOISE ON CEREBRAL OXIDATION PROCESSES IN ALBINO RATS [VLIIANIE DLITEL'NOGO SHUMA NA OKISLITEL'NYE PROTSESSY GOLOVNOGO MOZGA BELYKH KRYS].

N. F. Svadkovskaia, A. D. Komova, and V. S. Sobolev (USSR Acad. of Med. Sci., A. N. Sysin Inst. of Gen. and Communal Hyg., Moscow).

Gigiena i Sanitariia, no. 7, Jul. 1967, p. 19–23. In Russian.

The authors studied the effect of wide-band noise and high sound pressure levels in an experiment carried out on 140 albino male rats weighing 200–350 g. A white noise generator was used as the sound source. The time of the noise action amounted to 36, 72, 108, 144, 180 and 216 hr. Examination of experimental animals revealed a fall of the oxygen consumption rate in various parts of the cerebrum. A definite relation was established in between the extent of the fall of the oxygen consumption rate of the cerebral tissue and that of the time of action of noise and the level of sound pressure. The reactivity of separate parts of the cerebrum to the action of the same sound parameters was found to be quite different. The most pronounced fall of the oxygen consumption rate was noted in the cortex of the parietal region.

A68-80217

REFLEX ACTION OF A MIXTURE OF SULFUR DIOXIDE AND NITROGEN DIOXIDE [REFLEKTORNOE DEISTVIE SMESI SERNISTOGO GAZA I DVUOKISI AZOTA].

O. P. Shalamberidze.

Gigiena i Sanitariia, no. 7, Jul. 1967, p. 9–13. 6 refs. In Russian.

The threshold value of smell of sulfur dioxide for the majority of most sensitive persons was found to be at a level of 1.6 mg./m.^{3} and that of nitrogen dioxide at a level of 0.23 mg./m.^{3}. The joint concentration that could be detected by the smell of the mixture of sulfur dioxide and nitrogen dioxide (expressed as a fraction of the threshold value) amounted to 1.02. Consequently, in this case there was a summation of the effect produced by each of the investigated substances. The threshold value of nitrogen dioxide affecting the functioning of the visual analyzer was below the threshold value of smell and amounted to 0.14 mg./m.^{3}; the same threshold value of sulfur dioxide equaled 0.6 mg./m.^{3}. On simultaneous aspiration of both gases, there was a summation of their effects. The threshold values of the reflex action of sulfur dioxide and nitrogen dioxide are different in case of aspiration through the nose and that through the mouth. The latter fact points to a definite role of the receptors of the nasal cavity in the onset of reflex shifts in man on aspiration on these chemical substances.

A68-80218

SOME PROBLEMS OF PHYSIOLOGICAL OPTICS IN AVIATION MEDICINE [NEKOTORYE VOPROSY FIZIOLOGICHESKOI OPTIKI V AVIATSIONNOI MEDITSINE].

Iu. P. Petrov.

Vestnik Oftal'mologii, no. 5, 1967, p. 77–80. 20 refs In Russian.

Physiological optics in aviation medicine appears as a complex discipline that includes a series of sciences, in particular ophthalmology, physiology, hygiene, aviation and engineering psychology and a number of other related subjects. As principal; trends of research in physiological optics appear: (1) psychophysiological study of conditions for the activity and effect of flight factors on the visual analyzer in members of the aircraft crews; (2) elaboration of physiological and hygienic requirements and recommendations as to the work place, special outfits for the crew members, equipment, and visual instruments; (3) scientific substantiation of criteria and requirements as to the selection and examination of the flight personnnel, as well as an elaboration of methods for the examination of the visual analyzer function at the time of medical and flight testing by experts.

A68-80219

ORGANIC COMPOUNDS IN METEORITES–II. AROMATIC HYDROCARBONS.

R. J. Olson, J. Oro, and A. Zlatkis (Houston U., Dept. of Chem., Tex.)

Geochimica et Cosmochimica Acta, vol. 31, Oct. 1967, p. 1935–1948. 13 refs.

NASA Grant NsG-257 and NASA Grant NGR-44-005-020.

Benzene eluate fractions from chromatographic separations of extracts from carbonaceous chondrites, and a few other samples were examined for volatile organic components by high resolution capillary gas-liquid chromatography. A few meteorites gave evidence for the presence of small amounts of aromatic hydrocarbons, but most showed only traces. The amount present was apparently not directly related to the Wiik class nor to the amount of alkanes. However, when aromatic components were present, they were of relatively low molecular weight in Type I meteorites (Orgueil) and of somewhat higher molecular weight in Type II and III (Murray, Santa Cruz, Boriskino, and Mokoia). The benzene eluate fractions found in some meteorites were made up of large numbers of components, e.g. 60 to 140 in some cases, in relatively uniform concentrations. Compounds such as naphthalene, methylnaphthalene, biphenyl, acenaphthalene, scenaphthene, phenanthrene, and heavier components were apparently present.

A68-80220
ACCLIMATION OF THE WHITE RAT TO COLD: NORADRENALINE THERMOGENESIS.

L. Jansky, R. Bartunkova, and E. Zeisberger (Charles U., Fac. of Nat. Sci., Dept. of Comp. Physiol., Prague, Czechoslovakia).

Physiologia Bohemoslovaca, vol. 16, no. 4, 1967, p. 366–372. 17 refs.

The administration of 1-noradrenaline increases heat production in cold acclimated rats. The size of this calorigenic effect rises in an inverse linear ratio to the acclimation temperature, the maximum metabolic response to noradrenaline being observed at −4°C. These results show that the size of the calorigenic effect of noradrenaline is correlated to the degree of cold acclimation. It is therefore assumed that the size of non-shivering thermogenesis in the rat can be deduced from the size of the calorigenic effect of noradrenaline. Acclimation to different degrees of cold develops at the same rate. It develops most rapidly during the first week of exposure to cold and then slows down, maximum values being reached after about three weeks of adaptation. The course of deadaptation is similar and develops at the same rate in relation to time. Cold acclimation also develops in rats intermittently exposed to cold. In these animals the size of the metabolic response rises proportionately to the number of hours spent in cold.

A68-80221
LATE SOMATOSENSORY CORTICAL RESPONSE AND CEREBRAL DOMINANCE.

J. Cernacek and F. Podivinsky (Slovak Acad. of Sci., Inst. of Normal and Pathol. Physiol., Dept. of Electrophysiol. of the Nervous System, Bratislava, Czechoslovakia).

Physiologia Bohemoslovaca, vol. 16, no. 3, 1967, p. 256–263. 26 refs.

Some aspects of the late (long-latency or non-specific) components of cerebral somatosensory evoked responses in man were investigated in relation to cerebral dominance. The right and consequently the left ulnar nerve was stimulated while recording was carried out from the ipsilateral and contralateral parietal region of the scalp by means of the bipolar method. By means of the t-test for correlated samples it was shown that there is no significant difference between the parameters of contralateral and ipsilateral late response latencies and amplitudes to right side and left side stimulation respectively. Ipsilateral late responses show deflections only in one direction, depending on the lead arrangement of bipolar recording used with respect to the vertex region. No relation between polarity of late responses and cerebral dominance was found. According to the analysis, including latency and amplitude measurements, it is supposed that the late response components of the cortical evoked potential are not primarily and detectably involved in cerebral dominance. In this respect, the long-latency response stands in marked contrast to the early response, which occurred significantly more often from the dominant to the subordinate hemisphere than vice versa (as shown in an earlier study).

A68-80222
THE RELATIVE SENSITIVITY TO VIBRATION OF MUSCLE RECEPTORS OF THE CAT.

M. C. Brown, I. Engberg, and P. B. C. Matthews (U. Lab. of Physiol., Oxford, Great Britain).

Journal of Physiology, vol. 192, Oct. 1967, p. 773–800. 42 refs.

Longitudinal vibration was applied to the de-efferented soleus muscle of anesthetized cats while recording the discharge of single afferent fibers from the proprioceptors within the muscle. Conditions were defined under which vibration can be used to excite selectively the primary endings of muscle spindles without exciting the secondary endings of muscle spindles or Golgi tendon organs. Frequencies of vibration of 100 to 500 c.p.s. were used. Primary endings of muscle spindles were very sensitive to vibration. Most could be "driven" to discharge one impulse for each cycle of vibration over the whole of the above range of frequencies, provided the initial tension was moderate (20 to 200 g. wt.). The most sensitive endings could be driven by vibrations of below 10 μ amplitude. Stimulation of single fusimotor fibers increased the sensitivity of primary endings to vibration. Contraction of the main muscle, produced by stimulating α motor fibers, reduced the sensitivity of primary endings even when fusimotor fibers were also being stimulated. The secondary endings were very insensitive to longitudinal vibration, and with the amplitudes available not one of 25 endings could be driven at 150 c.p.s. or above; one ending could be driven at 100 c.p.s. by vibration 250 μ amplitude. Stimulation of single fusimotor fibers, probably all of which were static fusimotor fibers, made them slightly more sensitive to vibration, but none of them approached the sensitivity of the primary endings. The Golgi tendon organs were as insensitive as the secondary endings when the muscle was not contracting and none could be driven at any frequency in spite of quite high tensions in the muscle. However, when the muscle was made to contract by stimulating α fibers in ventral root filaments, the tendon organs became appreciably more sensitive, the degree of sensitization increasing approximately with the strength of the contraction. They never became as sensitive as the primary endings, and with the amplitudes of vibration available none was driven at frequencies of over 250 c.p.s. When the amplitude of vibration was somewhat below that required to produce driving of an ending, it still produced some increase in its mean frequency of discharge. However, amplitudes of vibration of 25 to 50 μ applied to a non-contracting muscle, whether with or without fusimotor stimulation, produced driving of nearly all primary endings without any significant increase in the mean frequency of firing of secondary endings or Golgi tendon organs. Such vibration can therefore be used as a specific stimulus for the primary endings in order to investigate the central effects of repetitive discharge of the Ia afferent fibers from them. Experiments on endings in the peroneus longus muscle showed that these behaved similarly to those in soleus.

A68-80223
THE EFFECTS OF LIGHT-ADAPTATION ON ROD AND CONE RECEPTIVE FIELD ORGANIZATION OF MONKEY GANGLION CELLS.

Peter Gouras (NIH, Natl. Inst. of Neurol. Diseases and Blindness, Ophthalmol. Branch, Bethesda, Md.).

Journal of Physiology, vol. 192, Oct. 1967, p. 747–760. 12 refs.

Receptive fields of perifoveal ganglion cells were measured by determining the threshold for eliciting a just detectable response using either concentric spot stimuli centered on the receptive field or small spot stimuli in different parts of the receptive field at various states of retinal adaptation and with stimuli selected to separate rod from cone function. Light adaptation decreased the

sensitivity, latency and duration of threshold responses throughout the receptive field of a ganglion cell. With all patterns of retinal stimulation and states of adaptation, threshold signals of the rods reached a ganglion cell later and those of the cones earlier than approximately 50 msec. after a light stimulus. In the more dark-adapted retina, threshold rod and cone signals could be transmitted to the brain by the same or by neighboring ganglion cells but not simultaneously; in the light-adapted state, only the cone signal was transmitted.

A68-80224
ATHLETES AT ALTITUDE.
L. G. C. E. Pugh (Natl. Inst. for Med. Res., Div. of Human Physiol., London, Great Britain).
Journal of Physiology, vol. 192, Oct. 1967, p. 619–646. 45 refs.

Six international middle-distance runners were investigated during four wk. in England and during a similar period in Mexico City (2,270 m (7,450 ft.)) In three-mile (4,828 m.) time trials at 2,270 m., the increase in time taken by four subjects compared with sea level was 8.5% on day 4 and 5.7% on day 29. There was thus a gain of 2.8% or 20 sec. in time associated with acclimatization. In one-mile (1,609 m) time trials the times were increased by 3.6% in the first wk. at altitude and by 1.5% in the fourth wk. The improvement amounted to 2.1%, or 4.9 sec. In five min. maximum exercise on the ergometer, maximum O_2 intake for six subjects at altitude was reduced by 14.6% on day 2 and 9.5% on day 27. Only one subject showed no change in maximum oxygen intake ($V_{O_{2,max}}$) with time spent at altitude. Although $V_{O_{2,max}}$ was persistently reduced at altitude work rates finally exceeded sea-level values, owing to increased over-all efficiency. Forty-minute recovery O_2 intakes after five min. maximum exercise averaged 17.35 1. at sea level and 17.53 1. at altitude. Mean values from 40th to 50th min. were within ±7% of pre-exercise values. Serial tests at increasing loads yielded a straight-line relation between O_2 intake and work rate over a wide range of work rates at sea level and at altitude. Heart rate and ventilation for given work intensity were maximal in the first two to ten days at altitude and thereafter declined. Capillary HbO_2 saturation fell from 93% at rest to 87% in maximum exercise. The corresponding alveolar gas tensions were arterial O_2 tension 89 min. Hg, arterial CO_2 tension 24 mm. Hg. About half the total unsaturation in maximum exercise was explained by the Bohr effect. In six of eight pairs of determinations $V_{O_{2,max}}$ measured on the ergometer was within ±0.15 1./min. of $V_{O_{2,max}}$ max measured on the running track. Nevertheless, it was not possible to predict running performance from ergometer measurements.

A68-80225
CIRCULATORY RESPONSES TO SUSTAINED HAND-GRIP CONTRACTIONS PERFORMED DURING OTHER EXERCISE, BOTH RHYTHMIC AND STATIC.
A. R. Lind and G. W. McNicol (Edinburgh U., Dept. of Med., Physiol. Branch, Natl. Coal Board, Great Britain).
Journal of Physiology, vol. 192, Oct. 1967, p. 595–607. 13 refs.

The cardiovascular responses to sustained hand-grip contractions at 20, 30 and 50% maximal voluntary contraction (MVC) were measured in subjects who were engaged in treadmill walking at three different rates with oxygen intakes of 1·1, 1·7 and 2·8 1./min. The increments in heart rate and blood pressure at tensions of 20 and 30% MVC were similar at all rates of walking, but the response to a contraction at 50% MVC was lower at the hardest work rate than at the two easier rates. When two or more muscle groups contracted at the same relative tension, the increments in heart rate and blood pressure were the same, whether they contracted separately or together. When two or more muscle groups contracted simultaneously at different relative tensions, the increments in heart rate and blood pressure were the same as when the muscle group, at the higher relative tension, contracted separately at the tension. The blood flow to a muscle engaged in sustained contraction was increased when a second muscle group contracted at a higher relative tension.

A68-80226
LOCAL AND CENTRAL CIRCULATORY RESPONSES TO SUSTAINED CONTRACTIONS AND THE EFFECT OF FREE OR RESTRICTED ARTERIAL INFLOW ON POST-EXERCISE HYPERAEMIA.
A. R. Lind and G. W. McNicol (Edinburgh U., Dept. of Med., Physiol. Branch, Natl. Coal Board, Great Britain).
Journal of Physiology, vol. 192, Oct. 1967 p 575–593. 19 refs.

The cardiovascular response to sustained contractions at tensions from 5 to 30% maximal voluntary contraction (MVC) were examined. At 5 and 10% MVC blood pressure, heart rate and forearm blood flow all reached a steady state during the contraction; post-exercise hyperemia did not show peak flows higher than those found during exercise. At tensions of 20 and 30% MVC, none of the measurements showed a steady state during the contractions, but increased steadily throughout the contraction; post-exercise hyperemia characteristically showed peak flows in excess of any flow measured during contractions. The results obtained at a tension of 15% MVC did not show a steady-state during the contraction but the following hyperemia showed a similar pattern to that seen at the lower tensions. Digital compression of the brachial artery after sustained handgrip contractions for periods of three to six min. after the contraction ended resulted in only a small reduction, on the average by 5 to 15%, of the post-exercise hyperemia. Consideration of the evidence leads to the view that in physiological circumstances the post-exercise hyperemia following sustained contractions bears a close relationship to the metabolism of the active muscles.

A68-80227
VISION IN CHICKS WITH DISTORTED VISUAL FIELDS.
Neville Moray and Anne Jordan (Sheffield U., Dept. of Psychol., Great Britain).
Psychonomic Science, vol. 9, Oct. 15, 1967, p. 303.

In a repeat of the experiment by Hess in which chicks were reared wearing hoods which bore prisms to distort the visual field by imposing a right deviation to it, it was found that such animals do not show a systematic displacement of their pecks. On the other hand, they become progressively less accurate in their pecking.

A68-80228
MAGNESIUM PEMOLINE: ENHANCEMENT OF SPONTANEOUS MOTOR ACTIVITY.
John J. Boitano and Joan C. Boitano (Rochester U., Center for Brain Res., N. Y.)
Psychonomic Science, vol. 9, Oct. 15, 1967, p. 295–296. 11 refs. PHS supported research.

Magnesium pemoline, a mild central nervous system stimulant, increased spontaneous motor activity in rats within 35 min. after injection. The effects persisted throughout the 30 min. period of observation. Three days later, during the post-drug phase, the drug group exhibited less activity than the control group. If valid, this "rebound" phenomenon may be explained by a central homeostatic inhibitory mechanism which limits overt activity after a period of prolonged hyperexcitability.

A68-80229
THE EFFECT OF DEEP HYPOTHERMIA ON RETENTION AND MOTIVATION IN THE RAT.
Charles L. Richman, Genevieve Parrett, Bernard Black-Schaffer, and R. J. Senter (Cincinnati U., Ohio).
Psychonomic Science, vol. 9, Oct. 15, 1967, p. 275–276. 5 refs.
NASA Grant NGR 36-004-014 and NASA Grant NsG 75-60.

Eleven hooded rats were trained to traverse a complex maze to a predetermined criterion. Subjects were then exposed to deep hypothermia and reintroduced to the complex maze. Error and running speed measures were not detrimentally affected by exposure to deep hypothermia.

A68-80230
THE ROLE OF STIMULUS FREQUENCY IN THE LOCALIZATION OF SOUND IN SPACE.
R. A. Butler, S. K. Roffler, and R. F. Naunton (Chicago U., Dept. of Surg. (Otolaryngol.), Ill.)
Journal of Auditory Research, vol. 7, Apr. 1967, p. 169–180.
Grants PHS NB4508 and PHS NB3815.

Listeners were required to locate tone-bursts and differently filtered noise-bursts on the horizontal plane. Stimulus frequencies within the range of two to four kc./s. appeared further toward the median plane than tones either higher or lower in frequency. The amount of displacement was also dependent on the azimuthal position of the sound source, being greater for those sounds originating more peripherally. Even a noise-burst appeared displaced toward the center if its frequency composition was restricted to a range of two to four kc./s. In one substudy, sound pressure levels inside the ear canal were measured. The data suggested that when a tone appears displaced toward the median plane, the interaural intensity difference provided by this stimulus is nearly the same as that provided by the same tone when it does indeed originate near the median plane.

A68-80231
TEMPORARY THRESHOLD SHIFT PRODUCED BY EXPOSURE TO HIGH-FREQUENCY NOISE.
Paul E. Smith, Jr. (E.I. du Pont de Nemours and Co., Haskell Lab. for Toxicol. and Ind. Med., Wilmington, Del.)
American Industrial Hygiene Association Journal, vol. 28, Sep.–Oct. 1967, p. 447–451.

The temporary threshold shift at two min. (TTS_2) produced by exposure to high-frequency noise was measured in a group having normal hearing. The noise source was filtered white noise. Peak frequencies used were at 16, 19, and 28 kilohertz. Sound pressure levels ranged from 85 to 100 db. Eleven different combinations of spectra and sound pressure levels were tested. The results indicated that significant TTS_2 could be produced at 6,000 hertz by high-frequency noise at 100 db. over-all sound pressure level if the noise source contained lower-frequency components in the 10- to 12-kilohertz range which were below 80 db. sound pressure level. Noise at this same level without the lower-frequency components appeared to improve hearing temporarily. The need for more definitive studies as indicated.

A68-80232
TECHNIQUES FOR EVALUATING BIOLOGICAL PENETRATION OF RESPIRATORY MASKS ON HUMAN SUBJECTS.
H. Gerald Guyton, Charles E. Mick, Herbert M. Decker, and William A. Burgess (Army Dept., Fort Detrick, Frederick, Md. and Harvard U., School of Public Health, Boston, Mass.)
(Am. Ind. Hyg. Assn., 28th Ann. Meeting, Chicago, May 5, 1967).
American Industrial Hygiene Association Journal, vol. 28, Sep.–Oct. 1967, p. 462–467.

Four types of respiratory samplers and associated test procedures used to quantitate protective mask leakage were described. These techniques utilized a nonpathogenic biological aerosol with a particle size range of one to five microns and a large aerosol chamber for exposing human subjects wearing protective masks. Mask leakage may be measured in amounts as low as one part in 50 million. Such sensitive test techniques have proved valuable during the experimental stages of mask development by detecting small leakage differences among prototype models, thereby guiding the designers in their selection of materials, components, etc. Because military and commercial protective masks are constantly undergoing redesign and improvement, the use of these samplers and test procedures will permit an accurate assessment of the degree of improved protection afforded by these new masks.

A68-80233
BEHAVIORAL EFFECTS IN PIGEONS EXPOSED TO MERCURY VAPOR AT A CONCENTRATION OF 0.1 MG/M^3.
R. P. Beliles, R. S. Clark, P. R. Belluscio, C. L. Yuile, and L. J. Leach (Rochester U., School of Med. and Dentistry, N. Y.)
American Industrial Hygiene Association Journal, vol. 28, Sep.–Oct. 1967, p. 482–484. 6 refs.
AEC supported research.

Three male Carneaux pigeons (one control, two experimental) were trained to a multiple FR-60 FI-15 schedule of reinforcement. After relative behavioral stability was obtained, the experimental animals were exposed six hr. a day for 20 wk. to mercury vapor at a concentration level of 0.1 mg./m.^{3}. No behavioral, histological, or gross signs of mercurialism were noted.

A68-80234
ALTITUDE EFFECTS ON THE HUMAN BODY. [PART I].
Gene W. Mason (Providence Hosp., Dept. of Anesthesiol., Everett, Wash.)
Northwest Medicine, vol. 66, Oct. 1967, p. 917–921.

High altitude causes four stresses on the human organism. These are: (1) decreasing temperature; (2) increasing ultra-violet radiation; (3) decreasing barometric pressure; and (4) decreasing partial pressure of oxygen. Heat is normally lost from the body via conduction, convection, radiation, and evaporation. Several of these are greatly accentuated at altitude, especially during mountaineering. The body responds to these losses with an initial compensatory response, and finally with a late decompensated response. The major problems at altitude result from a low partial pressure of oxygen in the inspired air, leading to a low hemoglobin saturation. The appearance and severity of the signs and symptoms of hypoxia depend upon the altitude, rate of ascent, duration of altitude, physical activity and individual tolerance. The symptoms can be divided primarily into cerebral and cardio-respiratory categories. This is the first of a two-part article.

A68-80235
AGE DIFFERENCES IN THE EFFECTS OF TERMINAL FOOD DEPRIVATION (STARVATION) ON ACTIVITY, WEIGHT LOSS, AND SURVIVAL OF RATS.
Leonard F. Jakubczak (Veterans Admin. Hosp., Gerontol. Psychol. Res. Lab., Jefferson Barracks, Mo.).
(Gerontol. Soc., 19th Ann. Meeting, New York, 1966).
Journal of Gerontology, vol. 22, part 1, Oct. 1967, p. 421–426. 14 refs.
Veterans Admin. supported research.

The purpose of this experiment was to determine whether or not there were age differences in the effects of food deprivation on the activity-wheel running of rats. Five age groups of male Sprague–Dawley rats (2-, 3-, 6-, 11-, and 26-mo. old) were assigned to Wahmann activity wheels. After an adaptation period, food was totally and permanently withdrawn from half of the rats within each age group, while food was continually available to the other half. The measures that showed a decrease with age to six mo. but not thereafter were: the initial and maximum levels of activity, the increase of activity/day to maximum, and the percentage of weight loss. The number of days of deprivation to maximum activity levels and the survival time increased with age to six mo. of age but not thereafter. There were no age differences with respect to the percentage of weight loss at maximum activity, the

percentage of weight loss at death, the relationship between percentage of weight loss and percentage of maximum activity, or the relationship between percentage of weight loss and percentage of survival time. The results indicate that percentage of body weight loss is a more comparable way to specifying degree of need and drive resulting from food deprivation in rats of different age groups than is duration of deprivation.

A68-80236

AGE DIFFERENCES IN RESPONSE TO CHRONIC HYPOXIA ON THE FINE STRUCTURE OF CARDIAC MUSCLE AND AUTONOMIC GANGLION CELLS.

Norman M. Sulkin and Dorothy F. Sulkin (Wake Forest U., Bowman Gray School of Med., Dept. of Anat., Winston-Salem, N. C.).

Journal of Gerontology, vol. 22, part 1, Oct. 1967, p. 485–501. 18 refs.

Grant NINDB NB 00342.

Twenty rats 90 to 120 days, 28 rats 636 to 687 days, and 10 rats 987 to 1004 days old were subjected to an environment of decreased O_2 for periods of 26 to 36 days. Rats from each age group were sacrificed at similar time intervals and O_2 levels. In the first two age groups, fine structural changes were observed in cardiac muscle and autonomic ganglion cells only at levels below 6% O_2. In these younger animals changes in the cardiac muscle were not observed before the 36th day in the chamber. The mitochondria were markedly enlarged, cristae separated or degenerated and the membranes in many instances disrupted. A diminution of mitochondria and swelling of tissue were also observed. The ganglion cells which were more resistant to hypoxic change exhibited swollen mitochondria with degenerate cristae, enlarged Golgi vesicles, presence of lipofusein pigment and the parallel stacking of endoplasmic reticulum. Marked changes were observed in the oldest age group at an earlier period and higher O_2 level, and were greatly accentuated over the younger groups. These changes were noted in both cardiac muscle and ganglion cells as early as the 26th day in the chamber at the 8% O_2 level. Changes in the cardiac muscle of the oldest group in the chamber for 28 days were more severe than those seen in the younger groups at 36 days. These included a breakdown of the mitochondria and swelling of myofibrils. In addition, an increase in lipid bodies and an invasion of muscle fiber by fibroblasts were observed. Changes noted in the ganglion cells of the oldest group increased in severity with the hypoxic conditions. At 28 days in the chamber with the O_2 level at 5.5% mitochondria were extremely enlarged, with accompanying loss of cristae and matrix. The cytoplasm often appeared in a degenerate state with loss of organelles. Alterations in the lipofusein pigment were observed. The animals in the oldest group did not survive after the 28th day in the hypoxic chamber.

A68-80237

ADRENOCORTICAL RESPONSE TO NOVELTY AND NOXIOUS STIMULATION.

S. B. Friedman and R. Ader (Rochester U., School of Med. and Dentistry, Depts. of Pediat. and Psychiat., N. Y.).

Neuroendocrinology, vol. 2, no. 4, 1967, p. 209–212. 7 refs.

Grants PHS MH-06163, PHS MH-06352, PHS K3-MH-18,542, PHS MH-03655, and PHS K3-MH-6318.

Rats were either subjected to high levels of electric shock or merely placed in the experimental edge for a comparable period of time. The experiment was conducted at the "peaks" and "troughs" of the adrenocortical circadian rhythm. The plasma corticosterone levels did not differ significantly in these two groups of rats, though both had significantly higher corticosterone levels than control animals. The data are interpreted as demonstrating that exposure to a new environment, or novelty, may contribute significantly to the adrenocortical response often attributed entirely to the effects of noxious or painful stimulation.

A68-80238

MSH ACTIVITY IN PITUITARIES OF RATS EXPOSED TO STRESS.

A. J. Kastin, A. Arimura, S. Viosca, L. Barrett, and A. V. Schally (Veterans Admin. Hosp., Endocrine and Polypeptide Labs. and Tulane U., School of Med., Dept. of Med., New Orleans, La.).

(Endocrine Soc., 49th Ann. Meeting, Miami, 1967).

Neuroendocrinology, vol. 2, no. 4, 1967, p. 200–208. 14 refs.

Grants PHS AM-07467 and PHS AM-09094.

The stress of ether inhalation for one min. induced a significant decrease in levels of pituitary melanocyte-stimulating hormone (MSH), which occurred within a few minutes and persisted for 24 hr. This MHS-depleting effect of ether was not blocked by pretreatment with dexamethasone or Nembutal. In addition, ether inhalation failed to prevent the elevation of pituitary MSH content after administration of MSH-release inhibiting factor (MIF). Whereas exposure to cold for 20 min. decreased pituitary MSH levels, this effect was not longer evident at 24 hr. The smell of blood, noise, starvation, and intraperitoneal injection did not exert any consistent effect on pituitary MSH content. Several experimental conditions were found in which pituitary ACTH content did not change in parallel with pituitary MSH content.

A68-80239

FURTHER NOTES ON THE PRINCIPLE OF THERMAL SIMILARITY AND HOMEOTHERMY.

B. Günther and B. Leon de la Barra (Chile U., Dept. de Cienc., Valparaiso).

Acta Physiologica Latino Americana, vol. 17, no. 1, 1967, p. 22–28. 12 refs.

An attempt was made to formulate again the principle of thermal similarity based only on three postulates in a four dimensional system (mass, length, time and temperature). The dimensional and solution matrices for 15 thermal functions of biological interest were developed in order to obtain 11 adimensional and invariant numbers by applying Buckingham's pi-theorem. Furthermore, several of these invariant and dimensionless numbers were studied in connection with some experimental findings concerning heat transfer processes ion biology.

A68-80240

ABSORPTION OF PHYTOL FROM DIETARY CHLOROPHYLL IN THE RAT.

James H. Baxter and Daniel Steinberg (NIH, Natl. Heart Inst., Lab. of Metab., Bethesda, Md.).

Journal of Lipid Research, vol. 8, Nov. 1967, p. 615–620. 27 refs.

The fate of ingested chlorophyll, particularly of the phytol portion of the molecule, was studied. Uniformly ^{14}C-labeled pheophytin a (the Mg-free derivative of chlorophyll a) was prepared from an extract of tobacco leaves grown in $^{14}CO_2$, and was administered by stomach tube to rats in which the thoracic duct had been cannulated. Only about 2% of the administered radioactivity was absorbed in 24 hr., largely into the thoracic duct lymph. Moreover, only a fraction of this lymph radioactivity was derived from phytol (i.e., was found in phytol, phytenic acid, or phytanic acid). The results indicated that not more than 1 to 2% of chlorophyll phytol is available for absorption by the rat. Similarly, after the administration of whole spinach or spinach extract (not labeled) to rats, only about 1% of the total phytol content was absorbed into the intestinal lymph. Nearly all of the administered phytol was found in the feces and the contents of the colon, and was still largely in the form of pheophytin. The study also indicated that little of the nonphytol portion of the chlorophyll molecule is absorbed.

A68-80241
DISTRIBUTION OF PERIPHERAL BLOOD FLOW IN PRIMARY TISSUE HYPOXIA INDUCED BY INHALATION OF CARBON MONOXIDE.
J. P. Chalmers, P. I. Korner, and S. W. White (New South Wales U., School of Physiol., Sydney, Australia).
Journal of Physiology, vol. 192, Sep. 1967, p. 549–559. 17 refs. Natl. Heart Found., Life Insurance Med. Res. Fund, and Australian Res. Grants Comm. supported research.

The effects of primary tissue hypoxia induced by the inhalation of small concentrations of carbon monoxide in air on the distribution of blood flow in the portal, renal, muscle and skin beds were studied in normal unanesthetized rabbits, in animals without functioning autonomic effectors ("de-efferented" rabbits) and in animals with section of the carotid sinus and aortic nerves ("de-afferented" rabbits). The pattern of blood flow distribution during CO hypoxia was similar in "de-efferented" and "de-afferented" animals, suggesting that the effects in the latter were determined by local mechanisms. The susceptibility of the various beds to the local dilator effects of CO hypoxia was markedly different, the greatest dilator effects being observed in the portal bed, followed by skin, kidney, and muscle. The pattern is somewhat different from that observed in arterial hypoxia. In this type of hypoxia the arterial baroreceptors are probably the main afferent source of reflex activity. In normal animals reflex constrictor effects affect the portal and renal beds most, "moderating" the local dilator effects of hypoxia in these beds. In muscle there is vasodilatation, probably the result of adrenaline secretion, but the response in skin is largely determined by the local effects of hypoxia. The total orthosympathetic activity evoked in this type of hypoxia appears to be less than in severe arterial hypoxia.

A68-80242
RANGES OF CIRCADIAN PERIOD LENGTH.
M. Lohmann (Princeton U., Dept. of Biol., N. J.).
Experientia, vol. 23, Sep. 15, 1967, p. 788–790. 28 refs.

Data compiled from the literature on a variety of animals was presented in which the ranges of circadian period length were determined by means of actograms on their running activities. The influence of light intensity on the circadian period was discussed, and the insect *Leucophaea maderae* was used for quantitative investigations of the effect of light intensity on the circadian period. It was found that the interspecific range of circadian periods of locomotor activity approximated 24 hr. ± 12%, whereas the variation within a single species lay between 4% and 15%. A response curve to constant light similar in principle to the response curves to light flashes was suggested.

A68-80243
ETHANOL INHIBITION OF AUDIOGENIC STRESS INDUCED CARDIAC HYPERTROPHY.
W. F. Geber and T. A. Anderson (Ga. Med. Coll., Dept. of Pharmacol., Augusta and H. J. Heinz Co., Nutrl. Res. Lab., Pittsburgh, Pa.).
Experientia, vol. 23, Sep. 15, 1967, p. 734–736. 21 refs.
Grant PHS HE-6488 and S. Dak. Heart Assn. supported research.

Virgin rats were subjected to two wk. of auditory stress or no stress during which time tap water or ethanol was administered. Ingestion of ethanol under control conditions produced a 4.3% decrease in body weight, auditory stress alone produced a 2.6% decrease and a combination of ethanol ingestion and auditory stress produced a 2.7% decrease in body weight. Alterations in the weights of the adrenals, kidneys and heart were recorded also. The relationship with reference to the adrenals was much the same as for body weight. It was demonstrated that ethanol ingestion under the control conditions was capable of producing a weight increase in both the kidney and the heart. Ethanol in the concentration used in the study apparently functioned as an antistressor in the presence of a different stress.

A68-80244
RETINAL IMPULSE ACTIVITY AND ELECTRORETINOGRAM UNDER THE INFLUENCE OF DESIPRAMIN [RETINALE IMPULSAKTIVITAT UND ELECTRORETINOGRAMM UNTER DEM EINFLUSS VON DESIPRAMIN].
W.-D. Heiss, P. Heilig, and J. Hoyer (Vienna U., Austria).
Experientia, vol. 23, Sep. 15, 1967, p. 728–729. 7 refs. In German.

The influence of Desipramin on electroretinogram (ERG) and optic nerve activity (42 single neurons) was studied in eight cats. The drug strongly suppressed the spontaneous activity of the neutrons, leaving the response to illumination practically uninfluenced. The c-wave of the ERG was increased. There was little doubt about a pure retinal origin of the effects.

A68-80245
BIOCHEMICAL BASIS OF OBLIGATE AUTOTROPHY IN BLUE-GREEN ALGAE AND THIOBACILLI.
Arnold J. Smith, Jack London, and Roger Y. Stanier (Calif. U., Dept. of Bacteriol. and Immunol., Berkeley).
Journal of Bacteriology, vol. 94, Oct. 1967, p. 972–983. 48 refs.
Grants PHS AI-1808 and PHS 5-F2-AI-16,387-03.

Differential rates of incorporation of sugars, organic acids, and amino acids during autotrophic growth of several blue-green algae and thiobacilli have been determined. In obligate autotrophs (both blue-green algae and thiobacilli), exogenously furnished organic compounds make a very small contribution to cellular carbon; acetate, the most readily incorporated compound of those studied, contributes about 10% of newly synthesized cellular carbon. In *Thiobacillus intermedius*, a facultative chemoautotroph, acetate contributes over 40% of newly synthesized cellular carbon, and succinate and glutamate almost 90%. In the obligate autotrophs, carbon from pyruvate, acetate, and glutamate is incorporated into restricted groups of cellular amino acids, and the patterns of incorporation in all five organisms are essentially identical. These patterns suggest that the tricarboxylic acid cycle is blocked at the level of α-ketoglutarate oxidation. Enzymatic analysis confirmed the absence of α-ketoglutarate dehydrogenase in the obligate autotrophs, and also revealed that they lcaked reduced nicotinamide adenine dinucleotide oxidase, and had extremely low levels of malic and succinic dehydrogenase. These enzymatic deficiencies were not manifested by the two facultative chemoautotrophs examined. On the basis of the data obtained, an interpretation of obligate autotrophy in both physiological and evolutionary terms has been developed.

A68-80246
EXPOSURES TO BERYLLIUM IN A BERYLLIUM ALLOYING PLANT.
Jacob Cholak, Lawrence Schafer, and David Yeager (Cincinnati U., Coll. of Med., Dept. of Environ. Health, Ohio).
American Industrial Hygiene Association Journal, vol. 28, Sep.–Oct. 1967, p. 399–407. 11 refs.
Contract AF 33(657)11036.

Continuous monitoring of the air at seven representative work locations in a beryllium alloying plant during a five-day period in 1960 showed that concentrations of beryllium in the air at all locations greatly exceeded the recommended limit of two micrograms per cubic meter of air. A similar survey during 1966 also yielded concentrations which exceeded the recommended limit for the greater portion of the time. Studies of the range of sizes of particles present in the air indicated that the particles were principally below two microns in size and that the particles in the so-called "respirable" range of sizes contained approximately 30%

of the total beryllium present in the air. Concentrations of beryllium fluctuated widely from hour to hour at each location. Average concentrations observed during the two surveys were considered representative of concentrations which had existed in the plant during the last 13 years of operation. No cases of chronic berylliosis disease were reported among workmen who were under close medical surveillance during that period.

A68-80247
GUIDELINES FOR NOISE EXPOSURE CONTROL.
American Industrial Hygiene Association (Detroit, Mich.).
American Industrial Hygiene Association Journal, vol. 28, Sep.–Oct. 1967, p. 418–424. 17 refs.

"Guidelines for Noise Exposure Control" of the American Industrial Hygiene Association are given. Procedures are presented for evaluating the hazard from noise exposures and for minimizing the development or aggravation of permanent hearing impairment resulting from prolonged noise exposure. The discussion includes procedures and methods for noise measurement, criteria for rating acceptable noise exposure, exposure control methods (reduction of environmental noise levels, reduction of exposure time and ear protection), planning hazard-free operations and audiometry.

A68-80248
SOME PHYSIOLOGICAL FACTORS IN NOISE-INDUCED HEARING LOSS.
Merle Lawrence, G. Gonzalez, and J. E. Hawkins, Jr. (Mich. U., Kresge Hearing Res. Inst., Dept. of Otorhinolaryngol., Ann Arbor).
American Industrial Hygiene Association Journal, vol. 28, Sep.–Oct. 1967, p. 425–430. 15 refs.
Grants PHS NB-03410, PHS NB-05065, PHS NB-05785, and PHS 1 F11 NB 1644-01 CDR.

Loss of auditory sensitivity following exposure to noise is the result of metabolic and structural alteration within the sensory cells of the organ of Corti. Similar changes can be caused by other agents which do not produce a recognizable change in hearing. However, noise is always superimposed upon the physiological state of the sensory epithelium, and this may determine the final affects of the noise. The source of nutrients for the sensory cells is the arcade of vessels lying beneath the basilar membrane. Localized occlusion of these vessels eventually produces degeneration of these sensory cells. Certain conditions produce constriction of some of these vessels, resulting in diminished blood supply and reduction in the metabolic state of the sensory cells. Superimposing overstimulation on these cells at this time would most likely have a destructive effect.

A68-80249
A NEW METHOD FOR RATING NOISE EXPOSURES.
James H. Botsford (Bethlehem Steel Corp., Pa.).
American Industrial Hygiene Association Journal, vol. 28, Sep.–Oct. 1967, p. 431–446.

A simple method for identifying acceptable noise exposures was developed from the NAS–NRC CHABA report describing hazardous exposures to intermittent and steady-state noise. First, an exposure was imagined in which the noise dropped to harmless levels periodically, thereby creating a number of identical exposure cycles distributed uniformly throughout the day. Next, the total duration of noise allowable per day was calculated for 39 different patterns of interrupted exposure, using the CHABA charts. This total noise duration permissible daily increased rapidly with the number of interruptions, passed through a maximum value for interruptions about five min. in length, and became constant for noise interrupted every two min. or oftener. Nine general contours of equinoxious octave-band sound pressure levels evolved from this analysis, and the A-weighted sound level equivalent to each contour was determined for noises of manufacturing industries. It was concluded that acceptable noise exposures can be identified as accurately by using A-weighted sound levels as by using octave-band sound pressure levels.

A68-80250
THE ASSESSMENT OF HUMAN PERFORMANCE FOR THE ANALYSIS OF SPACE MISSIONS.
Theodore Marton, Carl E. Helm, Bert Green, and Marcel Martin (Gen. Elec. Co., Valley Forge Technol. Center, King of Prussia, Pa.).
Behavioral Science, vol. 12, Nov. 1967, p. 490–497.

The authors consider the problem of developing a computer program to assist the aerospace psychologist in the task of assessing human performance reliability. The procedures which were developed permit an analysis of physiological and psychological variables relevant to human performance in space, the stressors that cause degradation in performance because they impair physiological and psychological functions, and the tasks that humans must perform. The degrading effect of each stressor is specified for each physiological and psychological variable, and the combined effect of all stressors on each variable is calculated. The status of all physiological and psychological variables relevant to the performance of a given task is assessed and a resultant reliability for each task is calculated. The minimum reliability within a given time period is used to produce a reliability profile. The system was used to obtain reliability ratings based on estimates of conditions for a hypothetical lunar mission.

A68-80251
SENSATION OF HEARING IN ELECTROMAGNETIC FIELDS.
Clyde E. Ingalls (Cornell U., School of Elec. Eng. and Cornell Aeron. Lab., Inc., Ithaca, N. Y.).
(Med. Soc. of State of N. Y., 160th Ann. Meeting, New York City, Feb. 17, 1966).
New York State Journal of Medicine, vol. 67, Nov. 15, 1967, p. 2992–2997. 6 refs.

A series of experiments is described in which radar transmitters operating at 1, 3, and 10 kv megacycles/sec were "heard." Apparently, the process of hearing did not involve the ear, but included only the brain and nervous system in the immediate vicinity of the brain. The effect takes place at energy levels that are considered safe for exposure all day. The effect is suggested as a means of aiding in the location of hearing difficulties in persons. It is also discussed in connection with reports of the hearing of meteors and auroras.

A68-80252
TRANSDUCERS USED FOR THE REGISTRATION OF SOME PHYSIOLOGICAL PARAMETERS IN MAN DURING EFFORT [CZUJNIKI STOSOWANE DO REJESTRACJI NIEKTORYCH PARAMETROW FIZJOLOGICZNYCH U CZLOWIEKA W CZASIE WYSILKU].
H. Zakrzewski.
Wychowanie Fizyczne i Sport, vol. 11, no. 2, 1967, p. 49–53. 10 refs In Polish.

This work presents the construction and principle of miniature transducers permitting the registration of electrocardiogram photoplethysmogram and rhythm of breathing during physical exertion. The transducers may be used in radiotelemetric and cable apparatus.

A68-80253
ACUTE ACOUSTIC TRAUMA [DAS AKUTE AKUSTISCHE TRAUMA].
W. Ey (U.-Hals-Nasen-Ohren-Klin., Heidelberg, West Germany).
Arbeitsmedizin Sozialmedizin Arbeitshygiene, vol. 2, Jul. 1967, p. 251–256. 25 refs. In German.

Acute trauma of a suddenly occurring injury of the auditory organs by high energy sound waves during a short period was discussed. A clinical picture of auditory disturbances was presented using the physical parameters of effective sound. The accurate analysis of corresponding ear injuries allowed two modes of origination to be distinguished: (1) noise with a sound intensity greater than 120 DIN-Phon for a short duration caused an acute auditory trauma which was marked by a typical decrease in the audio frequency threshold curve at the high frequency range; and (2) noise with a sound intensity of 90 to 120 DIN-Phon for a short duration caused an auditory trauma with simultaneous hemorrhage of the inner ear, which was greater on the audio frequency threshold curve at the middle frequencies. The effect is irreversible if the injuries are not treated immediately.

A68-80254
MEASUREMENT OF THE FLUORESCENT LIFETIMES OF CHLORELLA AND PORPHYRIDIUM IN WEAK LIGHT.
W. J. Nicholson and J. I. Fortoul (Columbia U., IBM Watson Lab., New York, N. Y.)
Biochimica et Biophysica Acta, vol. 143, Nov. 1967, p. 577–582. 11 refs.

The fluorescent lifetimes of *Chlorella* and *Porphyridium* were measured by determining the emission time distribution of fluorescent photons following excitation by a flash lamp. A lifetime of 0.6 ± 0.2 nsec. was determined for both species exposed to light of an average intensity less than 1 erg./sec. per $cm.^2$. No lifetime greater than 1 nsec. with a relative yield greater than 10% was found.

A68-80255
A LONG-WAVE ABSORBING FORM OF CHLOROPHYLL A RESPONSIBLE FOR THE "RED DROP" IN FLUORESCENCE AT 298° K AND THE F723 BAND AT 77° K.
M. Das and Govindjee (Ill. U., Dept. of Botany, Urbana).
Biochimica et Biophysica Acta, vol. 143, Nov. 1967, p. 570–576. 23 refs.
AEC, PHS, and NSF supported research.

When *Chlorella pyrenoidosa* cells are ruptured at pH 4.6 by sonication in air, its absorption spectrum can be best explained if one assumes that a long-wave chlorophyll a form (Chl a 693) is preferentially destroyed. Using these preparations, and comparing them with the algal suspension and the sonicates prepared at pH 7.8 under argon, we make the following conclusions: (a) The red drop beginning at about 675–680 nm. in the action spectrum of fluorescence at 298° K must be due to the presence of a non- (or weakly) fluorescent form of chlorophyll a. We suggest that this form is Chl a 693. The red drop is absent in the aerobic sonicates. (b) The red drop in fluorescence in whole algal cells is not due to any errors in absorption measurements; this drop is clearly present in the anaerobic sonicates. (c) The emission band at 723 nm. in whole Chlorella cells at 77°K may be due to increased fluorescence efficiency of Chl a 693 at low temperature; the F_{723} band is absent in aerobic sonicates.

A68-80256
PECULIARITIES OF THERMOREGULATION IN HENS AFTER CONTROLLED TEMPERATURE DOSES [OB OSOBENNOSTIAKH TEPLOREGULIATSII U KUR PRI DOZIROVANNYKH TEMPERATURNYKH VOZDEISTVIIAKH].
E. A. Shevel'ko (USSR, Acad. of Med. Sci., Inst. of Exptl. Med., Leningrad).
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 64, Sep. 1967, p. 29–32. 8 refs. In Russian.

Temperature changes were studied of various areas of the body, respiratory rate, and electrical activity of muscles in hens under varying temperatures (cold, heat). The data obtained confirm the existence of a good chemical thermoregulation in hens as well as the activity of the muscular system reacting to cold by intense shivering. Among mechanisms of physical thermoregulation in hens, along with polypnea, the author noted the presence of initial vasomotor reactions, seen in the limbs mostly due to low temperature.

A68-80257
NEW DATA ON THE SPECTRUM OF SOUND AND ULTRASOUND FREQUENCIES PRODUCING SOUND EFFECT IN MAN [NOVYE DANNYE O SPEKTRE ZVUKOVYKH I UL'TRAZVUKOVYKH CHASTOT, VYZYVAIUSHCHIKH SLUKHOVOE OSHCHUSHCHENIE U CHELOVEKA].
B. M. Sagalovich and G. G. Melkumova.
Biulleten' Eksperimental'noi Biologii i Meditsiny, vol. 64, Sep. 1967, p. 12–15. 9 refs. In Russian.

Results are reported of measurements of thresholds of sound stimulation for a spectrum frequency ranging between 8 c.p.s. and 225 kc./s. The data obtained were taken to construct audiometric curves, characterizing man's hearing under normal conditions in the entire range of the above frequencies. It was found that the human ear is able to respond to the sounds of the usual spectrum as well as ultrasounds (conducted through the bone) and infrasounds. Hearing sensitivity decreases markedly for frequencies below 100 and above 10,000 c.p.s.

A68-80258
ETHICAL CONDUCT IN PEACEFUL USES OF OUTER SPACE.
Kurt Waldheim.
(Med. Soc. of State of N. Y., 160th Ann. Meeting, New York City, Feb. 17, 1966).
New York State Journal of Medicine, vol. 67, Nov. 1, 1967, p. 2828–2831.

The dangers to peace which exist and may arise in the future stem from the threat or use of force in violation of international ethical obligations. The standards which must be used in determining and controlling extensions of national power have not been altered by the new world which outer space activities has opened. This was recognized by the United Nations General Assembly when it declared that "international law, including the Charter of the United Nations, applies to outer space and celestial bodies." The standards of judgement remain those set forth in the Charter of the United Nations. The ethics laid down by the principles of the Charter set the limits of permissible state conduct, and they express a fundamental goal of the organized international community, including the exploration of outer space for peaceful purposes through the medium of international cooperation for the benefit of all mankind.

A68-80259
BACK TO BASICS.
ALPA Aeromedical Coordinating Committee.
Air Line Pilot, vol. 36, Sep. 1967, p. 14–15.

A warning about the hazards from sudden decompression, hypoxia and hyperventilation is made as well as suggestions to counteract these emergencies during flight. The dangers of being pulled out of the aircraft during flight due to decompression are warned against. It is urged that civil aviation pilots avail themselves of training especially in regards to decompression and hypoxia. It is possible for these pilots to receive USAF training at a nominal sum.

A68-80260
MEDICINE IN THE SPACE AGE.
Thomas H. Crouch.
Spaceflight, vol. 9, Oct. 1967, p. 336–337.

A presentation is given of the many medical uses made of ideas and devices resulting from the aerospace industry. Use of plastic parts, mercury batteries, hyperbaric chambers, covergent-research techniques are some of the many items mentioned.

A68-80261
THE STEREOSPECIFICITY OF DESATURATIONS OF LONG-CHAIN FATTY ACIDS IN CHLORELLA VULGARIS.
L. J. Morris, R. V. Harris, W. Kelly, and A. T. James (Unilever Res. Lab., Biochem. Div., Sharnbrook, Bedford, Great Britain).
Biochemical and Biophysical Research Communications, vol. 28, Sep. 27, 1967, p. 904–908. 10 refs.

Racemic *erythro*-and *threo*-isomers of 9, 10-dideutero-stearic, 12, 13-dideutero-oleic and 15, 16-dideutero-oleic acids and isomers of D-and L-enantiomers of 9-tritio-and 12-tritio stearic acids were used as substrates of *Chlorella vulgaris* desaturation reactions. It was indicated that *cis* pairs of hydrogens were removed in enzymic formation of these double bonds. The hydrogens removed from the 9- and 12-positions, hence the 10- and 13-positions are of the D-configuration. A proposal is made showing the mechanism of removal of the *cis*-hydrogens. This work corroborates previous studies in *Cornynebacterium diptheriae*.

A68-80262
THE HYPOCALCEMIC EFFECT OF CALCIUM.
George B. Theil and Jay R. Miller (Iowa U., Coll. of Med., Dept. of Med., Iowa City).
Life Sciences, vol. 6, Sep. 15, 1967, p. 2009–2012. 6 refs.

The effect of calcium injections on the blood calcium level was studied in rats. Rats injected with 10 mg. of calcium chloride showed significant decreases in both calcium and phosphorus plasma levels after 60 min. It is not known if this decrease is mediated by thyrocalcitonin.

A68-80263
ON THE OPTIMUM ROOM TEMPERATURE FOR MUSCULAR AND MENTAL WORK IN SUMMER.
Toyohiko Miura, Kikuzi Kimura, Yoshio Tominaga, Kuninori Kimotsuki, Yasuko Suzuki, Kokichi Numajiri, and Hideko Nomura.
Journal of Science of Labour, vol. 43, Sep. 1967, p. 495–519. 44 refs. In Japanese.

Experiments were conducted in 1959–1965 to determine the optimum temperature of room cooling for sedentary light, mental work, and muscular work in the summer. Four healthy, male students (20–25 yr. of age) served as subjects and the experiment was conducted daily on two of them. Each subject wore a shirt, an undershirt and trousers. In the experiment in 1965, subjects were exposed at first for 30 min. to a temperature of 25°C. Then they were exposed to a temperature of 20°C., 25°C. or 30°C. with relative humidity of 50–60% to stay 195 min. During a second stay in the psychrometric chamber (20°C., 25°C. and 30°C. with 50–60% relative humidity) 15 min. muscular or mental work with five min. intervals was repeated eight times. The intensity of muscular work by the hand ergometer was 3.7 and 1.7 in relative metabolic rate (RMR 3.5≈4.5 Kcal./min., RMR 1.7≈2.8 Kcal./min.). Observations were made on the following items through the whole course of this experiment: the rectal temperature, skin temperature, pulse rate, blood pressure, extrarenal water loss, local perspiration, electrical skin resistance. Inquiries into feeling of warmth and comfort were also made. Variation of the physiological functions during work for 195 min. at room temperatures of 30°C., 25°C. and 20°C. are given.

A68-80264
EFFECTS OF A DRAMAMINE–ANALGESIC–CAFFEINE COMBINATION ON MOODS, EMOTIONS, AND MOTIVATIONS.
Jean S. Cameron, Priscilla G. Specht, and G. R. Wendt (Rochester U., Dept. of Psychol., N. Y.)
Journal of Psychology, vol. 67, Nov. 1967, p. 263–270. 8 refs.
Menly and James Labs., Smith Kline and French Labs., and Rochester U., supported research.

Acetaminophen plus salicylamide was combined with caffeine and dimenhydrinate, and with dimenhydrinate alone for administration to 39 males and 39 females. The effects were measured by forced-choice and free-choice adjective checklists. The effects of the three combinations were compared to those of dimenhydrinate alone, of the acetaminophen–salicylamide combination alone, and placebo. The sequence of effects, from slight mood improvement to considerable sedation were (a) acetaminophen–salicylamide–caffeine; (b) placebo, slight relaxation, (c) acetaminophen–salicylamide; (d) acetaminophen–salicylamide–caffeine–dimenhydrinate; (e) acetaminophen–salicylamide–dimenhydrinate; (f) dimenhydrinate. Dimenhydrinate (25 mg.) combined with acetaminophen–salicylamide had effects qualitatively and quantitatively similar to those of 8p mg. of dimenhydrinate.

A68-80265
SIMULTANEOUS ELECTRICAL RECORDING OF INDEPENDENT AND SUMMATED EYE MOVEMENTS.
J. W. Wolfe and G. R. Wendt (Rochester U., N. Y.)
Journal of Psychology, vol. 67, Nov. 1967, p. 201–204.
Contract DA-49-193-MD-24, Grant PHS 5 FLMH-23,100-02.

A method is described for the simultaneous electrical recording of independent and summated eye movements. Problems of interpretation of the records are discussed with relevant examples.

A68-80266
CYTOCHEMICAL STUDIES ON THE LIVER AND KIDNEY OF RATS AFTER CHRONIC INTOXICATION WITH ETHYL ALCOHOL AND SIMULTANEOUS MEDICATION WITH "ESSENTIAL" PHOSPHOLIPIDS [ZYTOCHEMISCHE UNTERSUCHUNGEN DER LEBER UND NIERE VON RATTEN NACH CHRONISCHER ATHYLALKOHOLINTOXIKATION BEI GLEICHZEITIGER MEDIKATION MIT "ESSENTIELLEN" PHOSPHOLIPIDEN].
L. Samochowiec, Z. Steplewski, and J. Wójcicki.
Acta biologica et medica germanica, vol. 18, 1967, p. 625–632. 36 refs. In German.

The effect of chronic alcohol intoxication, with simultaneous administration of Lipostabil, on the localization of acidic phosphatase and ATPase in the liver and kidney of albino rats was investigated. Chronic alcoholism is disturbing to the functional polarization of the hepatocytes, and is weakening or damaging to the lipoprotein membrane of the lysosomes, especially in the renal tubules. Essential phospholipid compounds protect the organs against the destructive effect of alcohol.

A68-80267
STIMULUS FORMATION DISTURBANCES IN THE ELECTROCARDIOGRAM DURING EXTREME HYPERTHERMIA [REIZBILDUNGSSTORUNGEN IM ELEKTROKARDIOGRAMM BEI EXTREMHYPERTHERMIE].
R. Henssge. (Med. Akad. "Carl Gustav Carus". Med. Klin., Dresden, East Germany).
Das Deutsche Gesundheitswesen, vol. 22, Sep. 14, 1967, p. 1729–1732. In German.

Disturbances in electrocardiographic recordings during extreme hyperthermia induced by the overheating bath were reported. Such disturbances were found in 41% of all treatments in 62.5% of all patients. Besides the releasing factor of extreme hyperthermia, the factor of individual disposition for developing such disturbances were also responsible. The rhythm disturbances were not functions

of body temperature, but were rather formed through influence on the thermoreceptors of the skin. Sinus arrhythmias and supraventricular extrasystoles mostly disappeared even if the treatment was continued, whereas ventricular extrasystoles frequently disappeared only after the drawing off of water and in single cases, only after cold water douches. If multiple ventricular extrasystoles occur, the treatment should be discontinued. Auricular flutter necessitates the immediate discontinuation of treatment.

A68-80268

DYNAMICS OF PULSE WAVES OF THE INTRACRANIAL PRESSURE DURING TRANSVERSE ACCELERATIONS (UP TO 40 G). [DINAMIKA PUL'SOVYKH VOLN VNUTRICHEREPNOGO DAVLENIIA PRI POPERECHNYKH PEREGRUYKAKH DO 40 ED].

Iu. E. Moskalenko, O. G. Gazenko, G. B. Vainshtein, and I. I. Kas'ian.

Izvestiia Akademii Nauk SSSR. Seriia Biologicheskaia, no. 3, May–Jun. 1967, p 396–403. 25 refs. In Russian.

The experiments carried out indicate that transverse accelerations of 15 g usually cause pulse waves of the intracranial pressure to reduce their amplitude. This depends on the fact that the stroke volume of the heart decreases and, consequently, general hemodynamic changes suppress disturbances in the intracranial circulation (rise of the intracranial pressure, brain hypoxia) which as such would increase an amplitude of pulse waves of the intracranial pressure. An increase of the amplitude observed in some experiments with accelerations of 15 g appears to be related to the prevailing effect of intracranial factors on parameters of pulse waves. An increase of pulse waves of the intracranial pressure occurring upon accelerations over 25 g may indicate either a restoration of hemodynamic parameters of the pulmonary circulation of development of the independent pulsation of vessels to be synchronized with the cardiac rhythm. In the after-effect period pulse waves show an increase with a peculiar simplification of their shape. This is due to the residual hypoxia of the brain tissue after accelerations. A comparatively rapid (two to seven min.) restoration of initial parameters of pulse waves of the intracranial pressure (shape and amplitude) gives evidence that brain liquidates its oxygen debt earlier than other organs.

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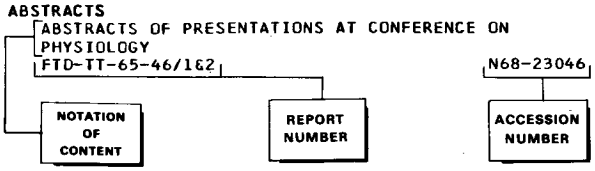

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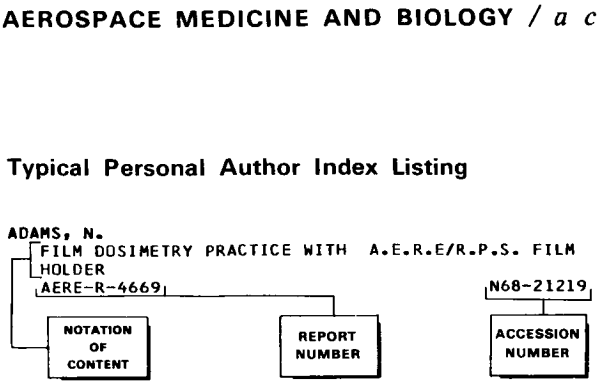

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